

Chinese species of genus *Notopygus* Holmgren (Hymenoptera, Ichneumonidae, Ctenopelmatinae) with description of a new species

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Abstract

A new species, *Notopygus longiventris* Sun & Sheng, **sp. n.**, collected from Benxi County, Liaoning Province, China, and *N. emarginatus* Holmgren, 1857, reared from *Neurotoma sibirica* Gussakovskij (Hymenoptera, Pamphiliidae) from Haicheng, Liaoning Province, are reported. The new species is placed within existing key to species.

Keywords

Ctenopelmatini, *Notopygus*, new species, key, host, Pamphiliidae, *Neurotoma sibirica*, China

Introduction

Notopygus Holmgren, 1857, belonging to the tribe Ctenopelmatini of the subfamily Ctenopelmatinae (Hymenoptera: Ichneumonidae), comprises 16 species (Yu et al. 2012), of which one is from the Oriental Region, nine from the Western Palaearctic

(five of them also found in the Eastern Palaearctic), six from the Eastern Palaearctic and four are from the Nearctic. The Palaearctic species were revised by Kasparyan (2002). A key to the species of the Eastern Palaearctic Region was given by Kasparyan and Khalaim (2007). The status of the genus was elucidated by Townes (1970) and by Kasparyan (2002).

Two species have been known from China, of which one, *N. emarginatus* Holmgren, 1857, found in Liaoning, was previously mistaken for *N. insignis* Kriechbaumer, 1891 (Chen et al. 2007). *Notopygus raricolor* (Aubert 1985), found in Sichuan, was originally described only from the male, and was redescribed, and its systematic position discussed by Kasparyan (2002).

Ecological and morphological notes on *Notopygus bicarinatus* Teunissen, 1953 (= *N. minkii* Vollenhoven, 1878) were made by Holuša et al. (2011). The biology of *N. emarginatus* Holmgren, 1857 in Haicheng, Liaoning Province (as *N. insignis*) was described by Chen et al. (2007).

In this article, three species of *Notopygus* are reported, of which one was reared from *Neurotoma sibirica* Gussakovskij (Hymenoptera, Pamphiliidae) in Haicheng, Liaoning Province, and one collected from Benxi, Liaoning Province, is new to science.

Materials and methods

The unique specimen of *Notopygus longiventris* Sun & Sheng, sp.n. was collected by intercept trap (Li et al. 2012) in the forests of Benxi County, Liaoning Province (China). Specimens of *N. emarginatus* were reared from *Neurotoma sibirica* Gussakovskij (Hymenoptera, Pamphiliidae) in Haicheng, Liaoning province, and collected while they were ovipositing into their hosts (Figure 11), as well as being collected with intercept traps and hand nets in the forests of Benxi and Kuandian, Liaoning province. The forest of Benxi is composed of mixed deciduous angiosperms and evergreen conifers, mainly comprising *Pinus koraiensis* Sieb. & Zucc., *Acer mono* Maxim., *Juglans mandshurica* Maxim., *Prunus padus* L., *Fraxinus rhynchophylla* Hance and *Ulmus pumila* L. The forest of Kuandian is composed of mixed deciduous angiosperms, mainly comprising *Quercus wutaishanica* Blume, *Celtis bungeana* Bl., *Larix gmelinii* (Rupr.) Rupr., *Prunus padus* and *Fraxinus rhynchophylla*.

Images of whole insects were taken with a Canon Power Shot A650 IS. Other images were taken using a Cool Snap 3CCD attached to a Zeiss Discovery V8 Stereomicroscope and captured with QCapture Pro version 5.1.

Specimens were compared with material from the Natural History Museum (NHM), London, UK and the Zoologische Staatssammlung München (ZSM), Germany.

The type specimen is deposited in the Insect Museum, General Station of Forest Pest Management (GSFPM), State Forestry Administration, People's Republic of China.

Results

Notopygus Holmgren, 1857

<http://species-id.net/wiki/Notopygus>

Notopygus Holmgren, 1857. Kongliga Svenska Vetenskapsakademiens Handlingar, 1(1)(1855):115. Type-species: *Notopygus emarginatus* Holmgren. Designated by Viereck 1912.

Diagnosis. Mandibular teeth of equal length, or lower tooth slightly longer than upper tooth. Tarsal claws not pectinate or weakly pectinate at base. Lateral longitudinal carina present. Apical portion of metasoma almost cylindric or depressed. First tergite without glymma. Posterior margin of tergite 8 rather frequently strongly projecting upwards. Female hypopygium strongly enlarged, widely convex at posterior margin. Ovipositor sheaths short, hardly projecting beyond metasoma apex, compressed. Ovipositor up-curved.

In Kasparyan's (2002) key to species, the new species can be inserted as follows:

- 7 (6) Tergite III almost entirely red, matte, finely shagreened. Hind tibia as long as 1st–3rd segments of hind tarsus combined. Posterior margins of tergites IV–VI widely emarginate, usually coriaceous, whitish.
- 7a (7b) Posterior margin of tergite 6 truncate (female). Posterior margin of tergite 8 weakly projecting upwards. Fore wing with vein 1cu-a distal to 1/M. Hind tibia distinctly shorter than 1st–3rd segments of hind tarsus combined
.....*N. longiventris* Sun & Sheng, sp. n.
- 7b (7a) Posterior margin of tergite 6 strongly concave forwardly (female). Posterior margin of tergite 8 sharply up-curved and projecting upwards. Fore wing with vein 1cu-a opposite or slightly basal of 1/M. Hind tibia as long as 1st–3rd segments of hind tarsus combined*N. emarginatus* Holmgren

Notopygus longiventris Sun & Sheng, sp. n.

<http://zoobank.org/2DE64C1A-8290-4F58-90C2-2FF1A5CABD60>

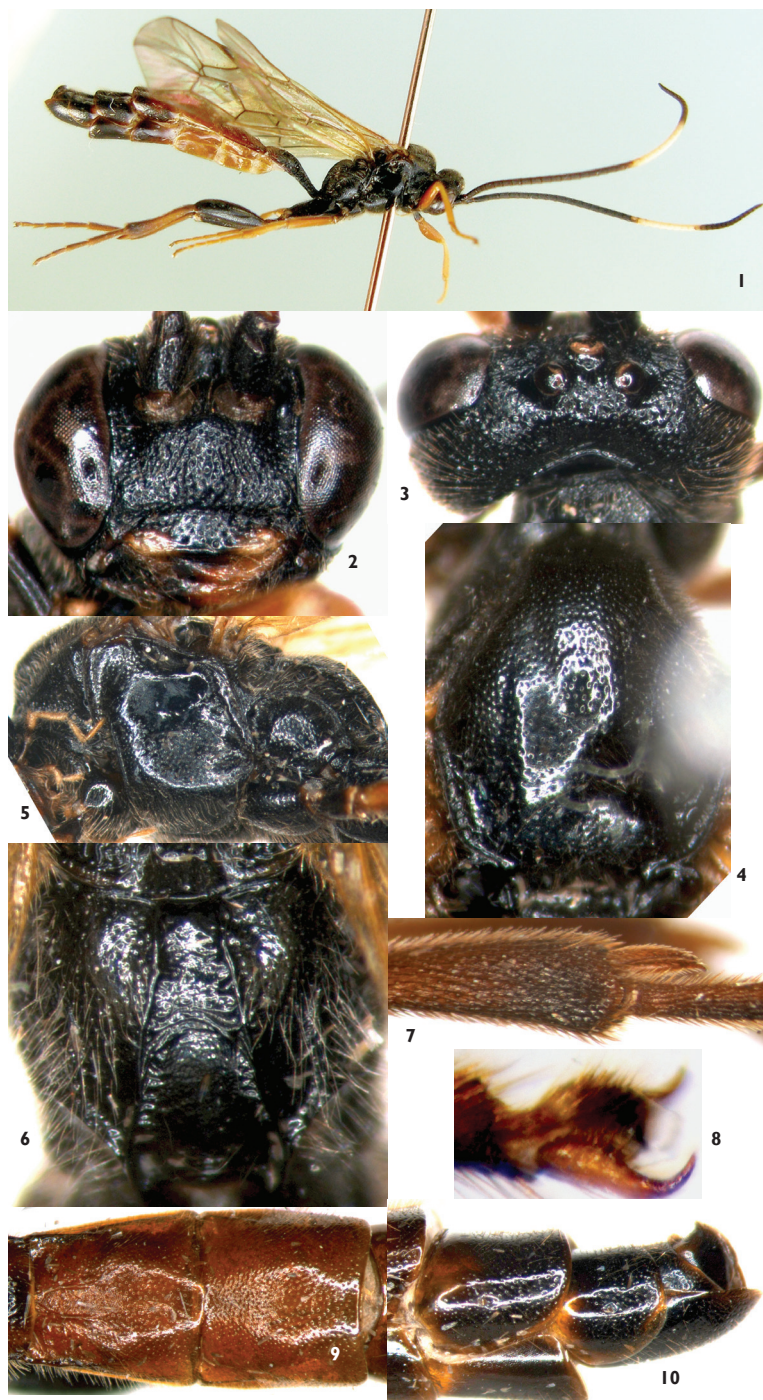
http://species-id.net/wiki/Notopygus_longiventris

Figures 1–10

Etymology. The specific name is derived from the elongate body.

Type. Holotype, female, CHINA: Benxi County, Liaoning Province, 4 July 2013, collected with intercept trap (Tao Li).

Diagnosis. Malar space very narrow, approximately 0.17 times as long as basal width of mandible. Frons strongly divided into two half, lower half deeply concave. Lower end of occipital carina joining hypostomal carina at base of mandible. Fore wing with vein 1cu-a distal to 1-M. Posterior margin of tergite 6 truncate. Posterior



Figures 1–10. *Notopygus longiventris* Sun & Sheng, sp.n. Holotype. Female **1** Habitus, lateral view **2** Head, anterior view **3** Head, dorsal view **4** Mesoscutum **5** Mesopleuron **6** Propodeum **7** Inner apical portion of hind tibia **8** Hind claw **9** Tergites 2–3 **10** Apical portion of metasoma, lateral view.

margin of tergite 8 slightly projecting upwards. Tergites 2, 3 and basal portion of tergite 4, lateral portions of tergites 5 and 6 brownish red.

Description. Female. Body length 15.0 mm. Fore wing length 9.5 mm. Antenna length 10.5 mm.

Head. Face (Fig. 2) 1.7 times as wide as long, median portion slightly convex longitudinally; with uneven punctures and longitudinal wrinkles; upper margin with a small median tubercle; between antenna socket and eye with obvious longitudinal concavity. Clypeus 3.3 times as wide as long, with shallow uneven punctures, median section of apical margin thick. Mandible (Fig. 2) distinctly elongate, with dense longitudinal wrinkles and fine punctures; upper tooth slightly shorter than lower tooth. Subocular sulcus absent. Malar space 0.17 times as long as basal width of mandible. Gena in dorsal view slightly longer than length of eye, with dense fine punctures and a few large uneven punctures. Vertex (Fig. 3) with dense indistinct punctures, postero-median portion distinctly concave. Postocellar line as long as ocular-ocellar line. Dorsal half of frons flat, with indistinct, weak, irregular wrinkles; lower half deeply concave, smooth, shiny. Antenna with 40 flagellomeres; ratios of lengths from first to fifth flagellomeres: 2.3:2.2:2.0:1.8:1.7. Occipital carina complete, lower end joining hypostomal carina at base of mandible.

Mesosoma. Anterior margin of pronotum with fine, blurry longitudinal wrinkles; lateromedian portion with dense oblique transverse wrinkles; upper posterior portion with distinct punctures. Epomia distinct. Mesoscutum (Fig. 4) smooth, shiny, with fine, uneven punctures. Scuto-scutellar groove wide, with short longitudinal wrinkles. Scutellum with dense punctures, subapically with transverse concavity. Postscutellum sharply, transversely convex, anterior portion transversely deeply concave. Lower half of mesopleuron with dense punctures (Fig. 5). Punctures in upper and anterior portion of mesopleuron correspondingly sparse. Speculum and its surrounding areas smooth and shiny. Upper end of epicnemial carina reaching about 0.6 distance to subalar prominence. Metapleuron convex, with dense, fine punctures. Juxtacoxal carina indistinct. Juxtacoxal area with dense oblique longitudinal wrinkles. Submetapleural carina complete. Wings brownish hyaline. Fore wing with vein 1cu-a slightly distal to 1-M. Areolet with short petiole, receiving vein 2m-cu at posterior 0.3. 2-Cu 2.0 times as long as 2cu-a. Hind wing vein 1-cu about 2.0 times as long as cu-a; cu-a slightly reclivous. Hind tibia 0.86 times as long as basal three segments of hind tarsus combined. Ratio of length of hind tarsomeres 1:2:3:4:5 is 2.7:1.8:1.3:0.8:1.1. Longest hind tibial spur (Fig. 7) slightly longer than widest width of hind tibia. Tarsal claws (Fig. 8) with 5–6 teeth at base. Propodeum (Fig. 6) with complete, strong median longitudinal, lateral longitudinal and pleural carinae. Lateral section of posterior transverse carina strong. Area superomedia combined with areas basalis and petiolaris. Costula absent. Basal-median portion between median longitudinal carinae with irregular, weak wrinkles. Area petiolaris almost smooth, lateral margins with weak transverse wrinkles. Between median longitudinal and lateral carinae smooth, with distinct punctures; between lateral longitudinal and pleural carinae with distinct punctures and long brown hairs. Propodeal spiracle almost circular.

Metasoma. First tergite about 1.9 times as long as apical width; median dorsal carinae reaching apical 0.2; interspace between median dorsal carinae slightly concave

and almost smooth and shiny. Lateral parts of postpetiole with dense transverse wrinkles. Dorsolateral and ventrolateral carinae complete. Spiracle circular, small, evidently convex, located at middle of first tergite. Second tergite (Fig. 9) almost shiny, 1.27 times as long as basal width, 0.93 times as long as apical width; basal 0.35 with a pair of median longitudinal carinae; from spiracle to base with a strong carina; with shallow, sparse, uneven punctures. Third and following tergites slightly shagreened. Third tergite with shallow, small, indistinct punctures; 0.95 times as long as basal width, 1.03 times as long as apical width. Lateral margins of tergites 4 to 6 almost parallel. Tergite 7 transverse. Tergite 8 smooth, shiny, basal-median portion concave, apical portion weakly projecting upwardly. Sternites 4 to 6 strongly sclerotized.

Color (Fig. 1). Black, except the following. Flagellomeres 18 to 27 white. Lateral portions of clypeus, maxillary and labial palpi yellowish brown. Median portion of mandible reddish brown, basal blackish brown, teeth black. Upper-posterior corner of pronotum, tegula, small indistinct spot on subalar ridge, anterior and middle legs except coxae, apical apex of hind trochanter, extreme base of hind femur, hind tibia except apical portion brownish black and base slightly blackish, reddish brown. Apical portion of tergite 1, tergites 2 and 3, basal portion of tergite 4, lateral portions of tergites 5 and 6 brownish red. Pterostigma blackish brown. Veins brownish black.

Remarks. This new species is similar to *N. emarginatus* Holmgren, 1857, and *N. eurus* Kasparyan, 2002, in having a white ring on the antenna, tergite 2 with a pair of median longitudinal carinae in basal portion, mandible partly brownish red, median tergites usually reddish brown, but can be distinguished from *N. emarginatus* by the key mentioned above, and can be distinguished from *N. eurus* by the following combination of characters. Frons strongly divided into two parts, lower part deeply concave, smooth; dorsal part flat, with indistinct, weak, irregular wrinkles. Scuto-scutellar groove with short longitudinal wrinkles. Fore wing with vein 1cu-a distal to 1/M. Hind wing vein 1-cu 2.0 times as long as cu-a. *N. eurus*: Frons not separated into two parts. Scuto-scutellar groove smooth without longitudinal wrinkles. Fore wing with vein 1cu-a opposite 1/M. Hind wing vein 1-cu about as long as or slightly longer than cu-a.

Notopygus emarginatus Holmgren, 1857

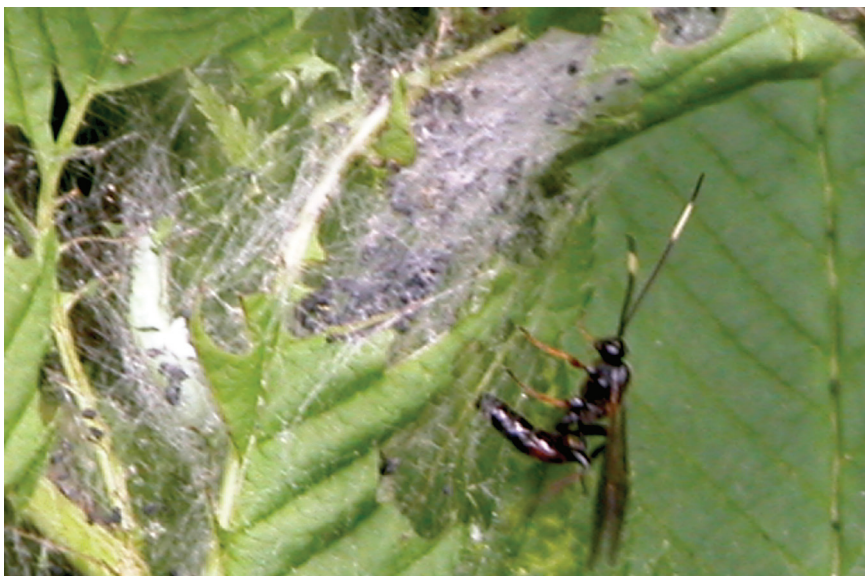
http://species-id.net/wiki/Notopygus_emarginatus

Figures 11–17

Notopygus emarginatus Holmgren, 1857. Kongliga Svenska Vetenskapsakademiens Handlingar, 1(1)(1855):115.

Notopygus insignis Kriechbaumer, 1891: Chen et al. 2007: Forest Pest and Disease, 26(6):8.

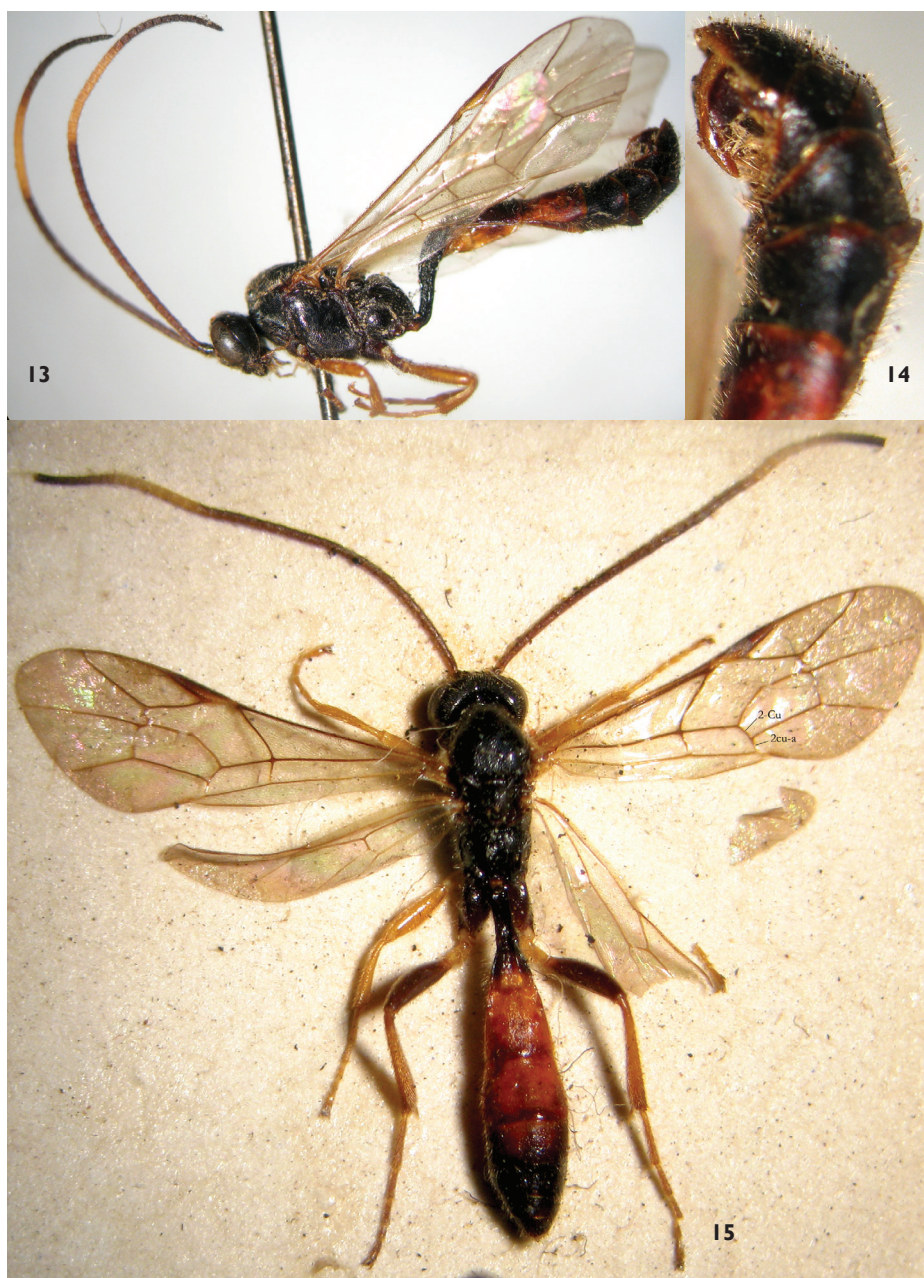
Specimens examined. 8 females, CHINA: Haicheng, Liaoning Province, 5 to 30 June 2004, leg. Tian-Lin Chen. 1 female, CHINA: Benxi County, Liaoning Province, 15 June



Figures 11. *Notopygus emarginatus* Holmgren, 1857. 11 Female ovipositing in larva of *Neurotoma sibirica* in the host's web.

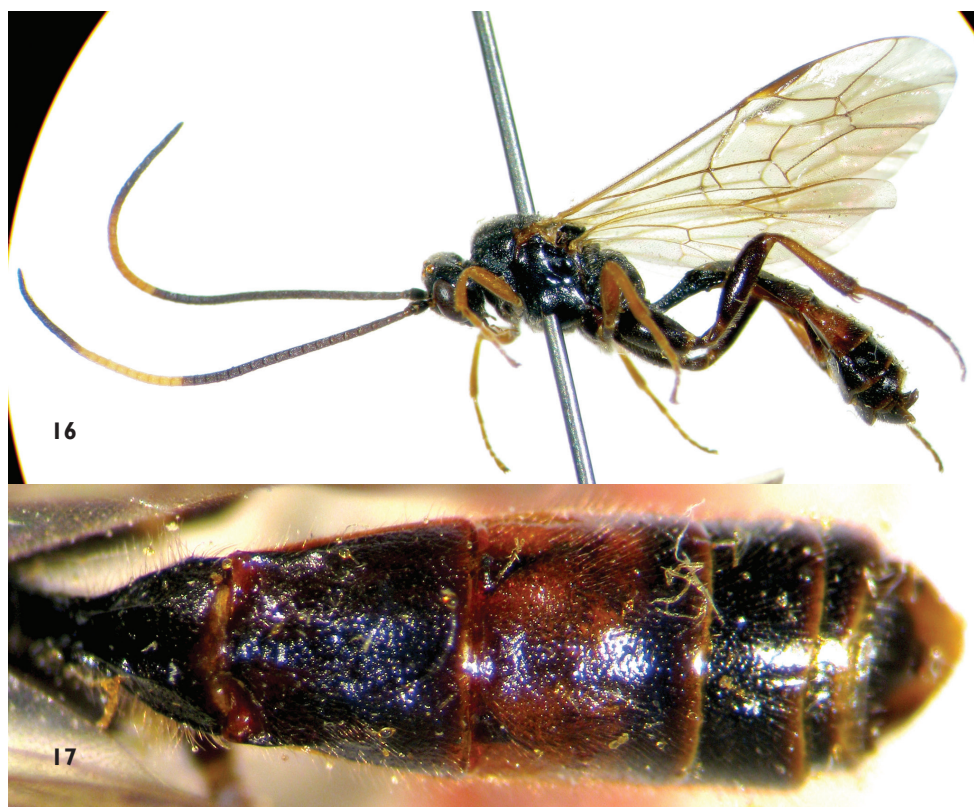


Figures 12. *Notopygus emarginatus* (GSFPM). 12 Female habitus, lateral view.



Figures 13–15. *Notopygus emarginatus* (NHM). **13–14** Female **13** Habitus, lateral view **14** Apical portion of metasoma, lateral view **15** Male habitus, dorsal view.

2006, leg. Mao-Ling Sheng. 1 female, CHINA: Baishilazi Natural Reserve, Kuandian County, Liaoning Province, 7 July 2011, Intercept trap. 1 female, CHINA: Benxi County, Liaoning Province, 12 August 2013, leg. Mao-Ling Sheng.



Figures 16–17. *Notopygus emarginatus* (ZSM). Female **16** Habitus, lateral view **17** Metasoma, dorsal view.

Hosts. *Neurotoma sibirica* Gussakovskij (Hymenoptera, Pamphiliidae).

Host plants. *Sorbaria sorbifolia* (L.); *Crataegus pinnatifida* Bunge.

Intraspecific variation. We also examined specimens deposited in the Natural History Museum, London (NHM) (Figs 13–15) and the Zoologische Staatssammlung München (ZSM) (Figs 16, 17). The female specimens have the same characters, except the color of the basal portion of the antenna and hind femora are a little variable. Tergites 2, 3 and the basal part of tergite 4 of males (Figure 15) are reddish brown.

Notopygus varicolor (Aubert, 1985)

Homaspis varicolor Aubert, 1985. Bulletin de la Société Entomologique de Mulhouse, 1985 (octobre-décembre): 49–58.

Remarks. The species was redescribed and discussed by Kasparyan (2002). Specimens have not been examined. Known from Sichuan Province, China (Aubert 1985, Kasparyan 2002). Host is unknown.

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Revision of the *Chaetocnema picipes* species-group (Coleoptera, Chrysomelidae, Galerucinae, Alticini) in China, with descriptions of three new species

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Abstract

The Chinese *Chaetocnema picipes* species-group is revised. It contains 5 species including 3 new species: *C. cheni* **sp. n.**, *C. constricta* **sp. n.** and *C. kingpinensis* **sp. n.** The lectotype of *C. fortetostata* is designated. A key to all known species of this group from China and the illustrations of habitus and genitalia are provided. A distribution map of species is given.

Keywords

Coleoptera, Alticinae, species group, new species, China, flea beetles

Introduction

Chaetocnema Stephens, 1831 is a cosmopolitan flea beetle genus with over 400 species known to world (Konstantinov et al. 2011). About 40 species are known to China. Nearctic, Palearctic and Afrotropical faunas of the genus have recently been revised (White 1996, Biondi and D'Alessandro 2006, 2010, Konstantinov et al. 2011), however Chinese *Chaetocnema* species remained mostly unknown.

Two distinct subgenera of *Chaetocnema* are recognized in the Palearctic. They are separated based on the following characters: relative width of the frontal ridge and density and size of punctures on vertex. Since a distinguishing power of these characters weakens significantly in more southern faunas (Biondi 2002, Konstantinov et al. 2011), identification of the subgenera becomes problematic. However, as in many other species rich flea beetle genera (e.g. *Aphthona* Chevrolat), distinct species groups may be recognized in *Chaetocnema*. One of these groups in China is the *picipes* species-group. Five distinct species here attributed to this group share the following characters: 5–7 punctures on vertex close to each eye, two short obscure longitudinal strips without punctures on the base of pronotum, punctures on elytra are arranged in lines, median lobe of aedeagus without deep groove or wrinkles on the ventral surface, apex of aedeagus without obvious denticle, pear-shaped spermatheca.

Chaetocnema species of the *picipes* group are usually found in the field feeding on *Rubus*, *Polygonum* and *Solanum*.

We studied all the specimens in IZCAS previously identified as *C. concinna* (Marshall) from different provinces of China. It turned out that they are indeed *C. picipes*, *C. fortetostata* sp. n. or *C. constricta* sp. n. *Chaetocnema concinna* is not found in China and all the published records of it in China should be treated as misidentifications.

Materials and methods

The female genitalia were dissected and mounted onto slides with Hoyer's medium, photos were taken with digital camera NIKON 5200D attached to the ZEISS AXIOSTAR PLUS Microscope. The photos of habitus were taken with the 5× lens of the same microscope with extra light source softened by semitransparent paper, so as to observe the real color of these tiny beetles. The photos of aedeagus were taken with the KEYENCE VHX-600 microscope. Scanning electron micrographs were taken with FEI QUANTA 450. A map of species distribution was generated by ARCGIS software. Descriptions of species were initially generated by LUCID software, exported from it and extensively edited.

Morphological terminology follows Konstantinov et al. (2011).

Places of distribution of this article are arranged from north to south provinces names in "Materials" paragraphs are in bold font.

Abbreviations: MBL = male body length; MLH = male body length without head; FBL = female body length; FLH = female body length without head; AL/BL = antenna length to body length; MBW = male body width; EL/EW = elytron length (along suture) to width (maximum); PW/PL = Pronotum width (at base) to length; EL/PL = elytron length to pronotum length; EWB/PWB = elytra width at base (in middle of humeral calli) to pronotum width at base; EWM/PWM = maximum width of elytra to maximum width of pronotum.

Abbreviations of collections: BMNH, The Natural History Museum, London, United Kingdom; IZCAS, Institute of Zoology, Chinese Academy of Sciences, Beijing, China; NHRS, Naturhistoriska Riksmuseet, Stockholm, Sweden; USNM, National Museum of Natural History, Washington D.C., USA; ZMAS, Zoological Institute of Russian Academy of Sciences, St. Petersburg, Russia.

Taxonomy

Chaetocnema picipes species-group

Diagnosis. Body small, usually 1.70–2.50 mm. 5–7 punctures on vertex close to each eye. Two short, weakly delineated longitudinal strip without punctures at base of pronotum. All rows of punctures on elytra single and regular, surface between rows smooth and glabrous. Median lobe of aedeagus lacking deep groove or transverse wrinkle on ventral surface, apical denticle weak or absent. Spermatheca pear-shaped or cylindrical, proximal part of spermatheca duct straight. All five species are very similar exteriorly. Color of their bodies and appendages varies between samples collected from different location. The most consistent characteristic to differentiate these five species is the shape of the male genitalia.

Based on the narrow frontal ridge and 5–7 punctures near each eye, species of the *picipes* group can be placed to the *Chaetocnema* subgenus.

Key to species of *Chaetocnema picipes* species-group

- 1 Body broad. First male protarsomere distinctly larger than second, appendages dark in color, anterolateral angles of pronotum round.....**2**
- Body narrow. First male protarsomere only slightly larger than second, appendages light in color, anterolateral angles of pronotum obtuse and thickened.....**4**
- 2 Metatibia proximad to denticle in dorsal view convex, apex of aedeagus subdeltoid, tip of aedeagus broad ***C. cheni* sp. n.**
- Metatibia proximad to denticle in dorsal view concave, apex of aedeagus obcordate, tip of aedeagus narrow.....**3**
- 3 Body bronzyish, aedeagus thickened in lateral view... ***C. fortetostata* Chen, 1939**
- Body copperish, aedeagus narrow in lateral view ***C. picipes* Stephens, 1831**

- 4 Body size in male 1.80–2.54 mm and in female 2.11–2.64 mm, length of antenna to length of body about 0.70, pronotum bronzyish and elytra blackish brown *C. kingpinensis* sp. n.
- Body size in male 1.71–1.80 mm and in female 2.15–2.31 mm, length of antenna to length of body about 0.62, pronotum and elytra bronzyish *C. constricta* sp. n.

***Chaetocnema (Chaetocnema) picipes* Stephens, 1831**

http://species-id.net/wiki/Chaetocnema_picipes

Fig. 1

picipes Stephens, 1831: 327 (type locality: England, “London” and “Bottisham, Suffolk”; type depository: BMNH; lectotype designated by Booth and Owen 1997: 88).

chalcona Jacoby, 1885: 731 (type locality: Japan, “Hosokute”; type depository: BMNH; lectotype designated by Konstantinov et al. 2011: 261); Heikertinger 1951: 82, synonymized with *C. concinna*.

laevicollis Thomson, 1866: 229 (type locality: Sweden, “Småland”; type depository: NHRS); Heikertinger 1951: 211, synonymized.

nitidicollis Jacobson, 1902: 91 (as variety of *C. concinna*; type locality: Russia, “Krasnojarsk”; type depository: unknown); Heikertinger 1951: 211, synonymized.

heikertingeri Lubischev, 1963: 863 (type locality: not given; type depository: ZMAS); Booth and Owen 1997: 88, synonymized.

Distribution. Heilongjiang, Liaoning, Inner Mongolia, Beijing, Hebei, Tianjin, Shanxi, Shandong, Gansu, Qinghai, Shaanxi; Europe, North Asia (Konstantinov et al. 2011); Madagascar (alien) (Biondi 2001).

Host plants. *Polygonum persicaria* Linn. (Polygonaceae), *P. aviculare* Linn., *Brassica rapa* Linn. (Cruciferae) (Fogato and Leonardi 1980); host plant recorded in China: *P. aviculare*.

Diagnosis. *Chaetocnema picipes* very much resembles *C. cheni* sp. n. and *C. forticostata* sp. n., but it can be reliably separated from them by the shape of the aedeagus (obcordate on the apex in ventral view and narrow in lateral view) and the copperish color of the body.

Description. MBL = 1.67–1.96 mm; MBH = 1.60–1.80 mm; FBL = 2.01–2.27 mm; MBH = 1.90–2.09 mm; AL/BL = 0.60±0.05; MBW = 1.02–1.13 mm; EL/EW = 2.42–2.49; PW/PL = 1.67–1.68; EWB/PWB = 1.10±0.05; EWM/PWM = 1.40–1.41.

Color of elytra, pronotum and head consistently copperish. Antennomere 1 partly dark brown. Antennomeres 2–3 yellow. Antennomere 4 yellow or partly brown. Antennomere 5 partly brown. Remaining antennomeres black. Pro- and mesofemora brown with yellow on the apex. Metafemora brown. Tarsi brown with yellow on base of each tarsomere.

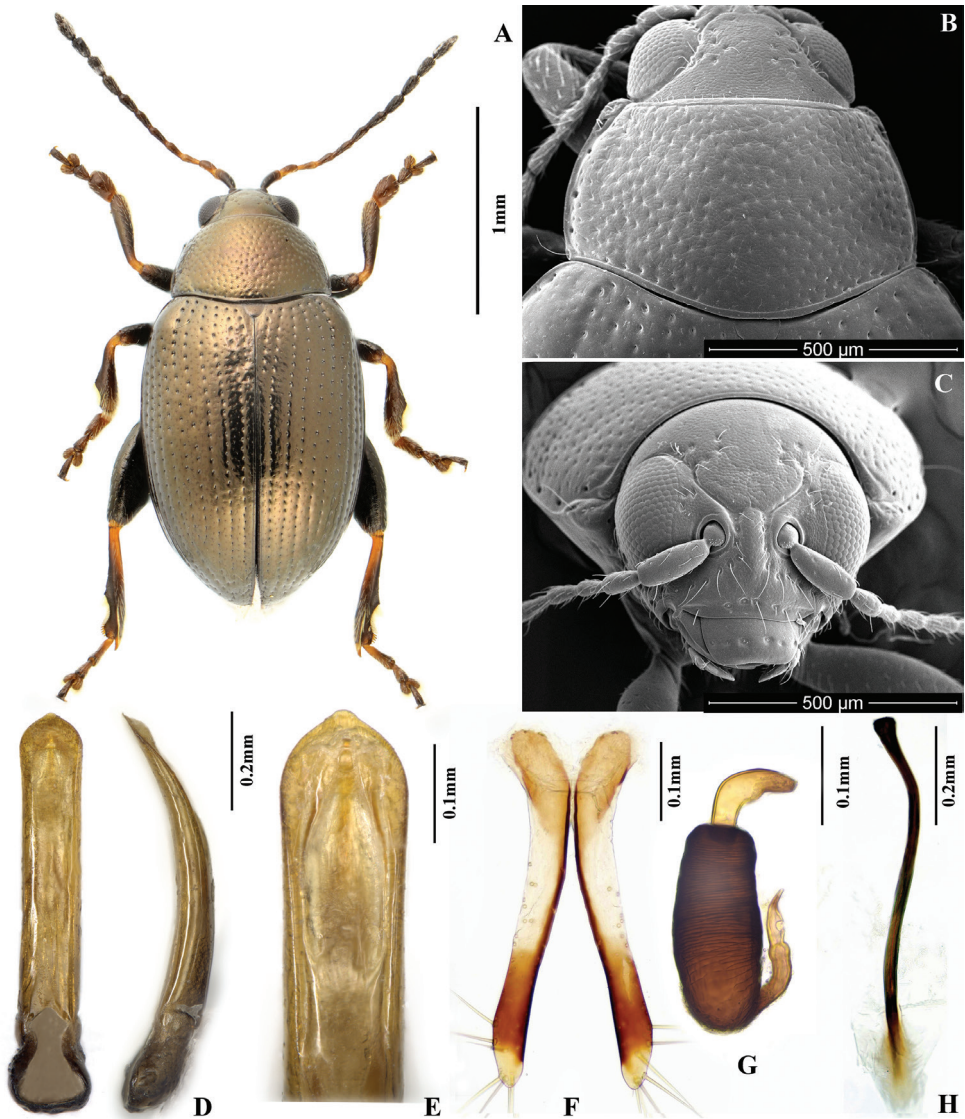


Figure 1. *Chaetocnema picipes*, (Qinling Mountain, Shaanxi, China). **A** Male habitus **B** Pronotum **C** Head **D** Aedeagus, ventral and lateral view **E** Apical part of aedeagus, dorsal view **F** Vaginal palpi **G** Spermatheca **H** Tignum.

Base of pronotum with two short, obscure longitudinal impressions without punctures near basal margin. Deep row of large punctures at base of pronotum present on sides, lacking in middle. Pronotal base evenly convex. Lateral sides of pronotum slightly convex with maximum width near base. Anterolateral prothoracic callosity protruding laterally forming round angle. Posterolateral prothoracic callosity projects up to lateral margin of pronotum. Diameter of pronotal punctures 2 to 4 times smaller than distance between them.

Elytra with convex sides. Scutellar row of punctures on elytron regular and single. Remaining rows of punctures regular. Elytral humeral calli well developed. Interspaces between rows of punctures smooth and glabrous. Two lines of minute punctures on each interspace.

Head hypognathous. Frontal ridge between antennal sockets narrow and convex. Frontolateral sulcus present. Suprafrontal sulcus shallow and faint or deep laterally, shallow in middle. Suprafrontal sulcus slightly concave. Orbital sulcus (above the antennal socket) deep, but rather narrow. Width of frontal ridge to width of antennal socket: 0.900–1.005. Width of orbital sulcus to width of frontolateral sulcus: 0.611–0.614. Surface of vertex sparsely and unevenly covered with 6–7 punctures near each eye. Numbers of punctures on each orbit: 2–3. Numbers of setae along frontolateral sulcus on each side: 8–10. Numbers of setae on frons (triangular area surrounded by frontolateral sulci and clypeus): 0. Numbers of setae on clypeus: 7. Numbers of setae on labrum: 6. Anterior margin of labrum slightly concave in middle.

First male protarsomere distinctly larger than second one. First male protarsomere, length to width ratio: 1.63–1.67. First and second male protarsomeres, length to length ratio: 2.00–2.03; width to width ratio: 1.55–1.59. First male protarsomere, width at apex to width at base: 2.58–2.64. Length of metatibia to distance between denticle and metatibial apex: 2.50–2.55. Large lateral denticle on metatibia sharp. Metatibial serration proximal to large lateral denticle present, obtuse. Metatibia proximal to denticle in dorsal view concave. First male metatarsomere, length to width ratio: 3.01–3.05. First and second male metatarsomeres, length to length ratio: 1.87–1.89. First and second male metatarsomeres, width to width ratio about 0.98. Third and fourth male metatarsomeres, length to length ratio: 1.64–1.68. Metatibia length to metafemora length: 0.81 ± 0.05 . Length of hind leg to length of body: 0.92 ± 0.05 .

Median lobe of aedeagus parallel-sided with apical third slightly widening. Apical part of median lobe in ventral view narrowing abruptly. Ventral longitudinal groove of median lobe absent in apical part and poorly developed in middle and basal part. Apical denticle of aedeagus in ventral view poorly differentiated, straight in lateral view. Minute transverse wrinkles on ventral side of median lobe absent. Median lobe in lateral view narrow and evenly curved. Width (in middle) to length of median lobe (in ventral view) about 0.15.

Spermathecal receptacle pear-shaped. Spermathecal pump much shorter than receptacle. Apex of spermathecal pump cylindrical. Spermathecal pump attached to middle of receptacle top. Maximum width of receptacle situated basally. Basal part of receptacle wider than apical. Posterior sclerotization of tignum spoon-shaped, wider than mid section. Anterior sclerotization of tignum wider than mid section. Apex of vaginal palpus subdeltoid, with lateral side slightly arching. Sides of middle part of vaginal palpus (before apex) narrowing from base, slightly widening towards apex. Anterior sclerotization of vaginal palpus slightly widening anteriorly. Anterior sclerotization of vaginal palpus slightly and evenly curved along length. Anterior end of anterior sclerotization broadly rounded. Length of posterior sclerotization greater than width. Posterior sclerotization about as wide as anterior sclerotization.

Materials (all the materials preserved in IZCAS): 1, Harbin, **Heilongjiang**, 11.VI.1965, leg. P. M. Hammond; 2♀1♂, Fujin, **Heilongjiang**, 16.VIII.1970; 15♀3♂, Mishan, **Heilongjiang**, 11-21.VIII.1970; 10♀2♂, Molida, Daxinganling Mountains, **Heilongjiang**, VII-VIII.1970; 1♂, Lingyuan, **Liaoning**; 1♀1♂, Chifeng, **Inner Mongolia**, 8.VIII.1956; 1♂, Fangshan, **Beijing**, leg. Cong; 5, **Beijing**, 5.VII.1980, leg. Subai Liao; 4, **Beijing**, 28.VI.1980, leg. Subai Liao; 14, Zhongguancun, **Beijing**, 8.VI.1962, leg. Shuyong Wang; 15, Yanqing, **Beijing**, 1.VII.1990, leg. Shuyong Wang; 1♀2♂, Shan-hai-Kwan, **Hebei**, 1.IX.1906, leg. F. M. Thomson; 1♀1♂, Xinglong, **Hebei**, 10.VII.1963, leg. Shengqiao Jiang; 1♂, **Tianjin**, 26.IX.1929; 1♀, **Tianjing**, 11.IV.1955; 5♀4♂, **Tianjing**, leg. F. M. Thomson, 1904; 3♀5♂, Lishan National Reserve, **Shanxi**, 112.016°E, 35.420°N, alt.1560m, 26.VII.2012, leg. Yongying Ruan & Zhengzhong Huang, feed on *Polygonum* sp.; 1♀1♂, Long-tong, Tsinanfou (Jinan), **Shandong**; 13♀4♂, Qiujiaba, Wenxian, **Gansu**, alt.2200-2350m, 29.VI.1998, leg. Shuyong Wang; 1♀, Datong, **Qinghai**, V.1956; 13♀28♂, Niubeiliang National Reserve, Qinling Mountain, **Shaanxi**, alt.1690m, 30.VI.2013, leg. Yuanyuan Lu; 4, Niubeiliang National Reserve, Qinling Mountain, **Shaanxi**, alt.1800m, 11.VI.2013, leg. Yongying Ruan; 5♀11♂, Haopingsi National Reserve, Qinling Mountain, **Shaanxi**, 34.095°N, 107.707°E, alt.1200m, 23.VIII.2013, leg. Yongying Ruan; 3♀9♂, Fengxian, Qinling Mountain, **Shaanxi**, 34.2352°N, 106.9572°E, alt.1500m, 21.VIII.2013, leg. Yongying Ruan.

Remarks. This species was recently revised by Booth and Owen (1997) and Konstantinov et al. (2011), and we follow the species status of these two thorough revisions.

We did not find any *C. picipes* specimens from South China, it seems that *C. picipes* is distributed only in the Palearctic part of China. The southern boundary of the distribution of *C. picipes* is the Qinling Mountain which is also a southern boundary of many other Palearctic faunistic elements (Yang 2005). We have collected *C. picipes* from several places from the north slope of Qinling Mountain during several expeditions, but we did not find any from the south slope. It is also interesting that the specimens collected from Qinling Mountain look darker, the color of the body, appendages, antennomeres and male genitalia are darker than other specimens from other places of northern China.

Chaetocnema (Chaetocnema) fortcostata Chen, 1939

http://species-id.net/wiki/Chaetocnema_fortcostata

Fig. 2

fortcostata Chen, 1939: 33 (type locality: “Beibei” Guanxi, China; type depository: IZCAS; lectotype designated here); Heikertinger 1951: 207.

Distribution. Shaanxi, Hubei, Chongqing, Sichuan, Zhejiang, Hunan, Jiangxi, Fujian, Yunnan, Guangxi.

Host plants. *Polygonum* sp. (Polygonaceae).

Diagnosis. *C. fortcostata* sp. n. is similar to *C. picipes* and *C. cheni* sp. n. But the aedeagus in lateral view is robust in *C. fortcostata* and slender in *C. picipes* and *C. cheni*. *C. fortcostata* have bronzish dorsal surface of its body, while *C. picipes* and *C. cheni* are copperish.

Description. MBL = 1.75–1.90 mm; MBH = 1.60–1.79 mm; FBL = 2.03–2.12 mm; FBH = 1.89–2.03 mm; AL/BL = 0.64 ± 0.05 ; MBW = 0.95–1.08 mm; EL/EW = 2.64 ± 0.05 ; PW/PL = 1.62 ± 0.05 ; EL/PL = 2.98 ± 0.05 ; EWB/PWB = 1.07–1.19; EWM/PWM = 1.34 ± 0.05 .

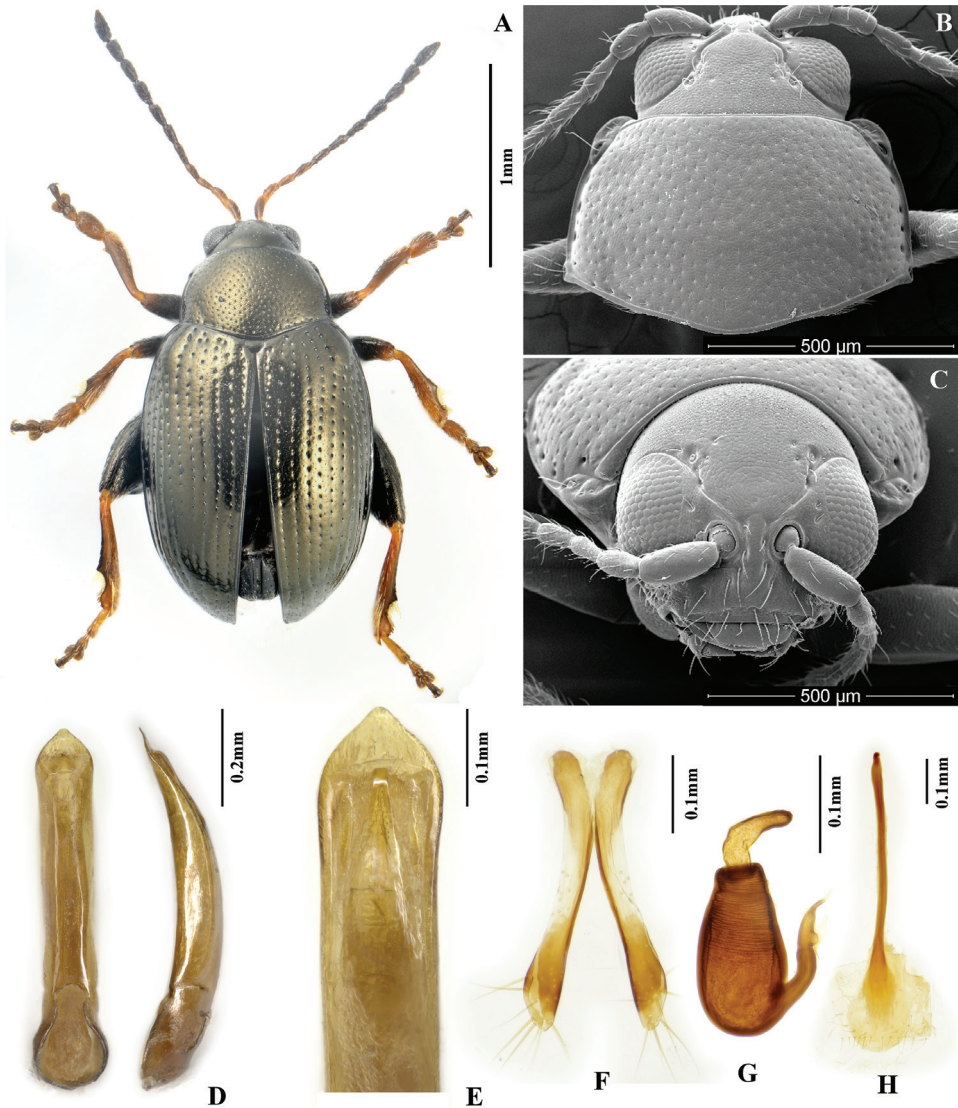
Color of dorsal side of body bronzish throughout, including head. Antennomere 1 partly dark brown. Antennomeres 2–3 yellow. Antennomere 4 yellow or partly brown. Antennomere 5 partly brown. Remaining antennomeres black. Pro- and mesofemora brown with yellow on apex. Metafemora brown. Tarsi brown with yellow on base of each tarsomere.

Head hypognathous. Frontal ridge between antennal sockets narrow and convex. Frontolateral sulcus present. Suprafrontal sulcus shallow and faint or deep laterally, shallow in middle. Suprafrontal sulcus slightly concave. Orbital sulcus (above antennal socket) obscure and narrow. Width of frontal ridge to width of antennal socket: 0.56–0.66. Width of orbital sulcus to width of frontolateral sulcus: 0.71 ± 0.05 . Surface of vertex sparsely and unevenly covered with 5–6 punctures near each eye. Numbers of punctures on orbit: 1–2 on each side. Numbers of setae along frontolateral sulcus: 5–6 on each side. Numbers of setae on frons (triangular area surrounded by frontolateral sulcus and clypeus): 0. Numbers of setae on clypeus: 5. Numbers of setae on labrum: 6. Anterior margin of labrum slightly convex in middle.

Base of pronotum with two short, obscure longitudinal impressions without punctures near basal margin. Deep row of large punctures at base of pronotum present on sides, lacking in middle. Shape of pronotal base evenly convex. Lateral sides of pronotum slightly convex with maximum width near base. Anterolateral prothoracic callosity protruding laterally forming strong round angle. Posterolateral prothoracic callosity projects up to lateral margin of pronotum. Diameter of pronotal punctures 2 to 4 times smaller than distance between them.

Elytra with convex sides. Scutellar row of punctures regular and single. Remaining rows regular. Elytral humeral calli well developed. Interspace smooth and glabrous. 2 lines of minute punctures on each interspace.

First male protarsomere, length to width ratio: 1.65 ± 0.05 . First and second male protarsomeres, length to length ratio: 1.94–2.24, width to width ratio: 1.42–1.45. First male protarsomere, width at apex to width at base: 1.60–1.75. Length of metatibia to distance between denticle and metatibial apex: 2.80–2.90. Large lateral denticle on metatibia sharp. Metatibial serration proximal to large lateral denticle present, obtuse. Metatibia proximad to denticle in dorsal view concave. First male metatarsomere, length to width ratio: 3.60–3.67. First and second male metatarsomeres, length to length ratio: 1.87–1.93, width to width ratio: 0.83. Third and fourth male metatarsomeres, length to length ratio: 0.60–0.65. Metatibia length to metafemora length: 0.76 ± 0.05 . Length of hind leg to length of body: 0.87 ± 0.05 .



Figures 2. *C. fortcostata*. **A** Male habitus **B** Pronotum **C** Head **D** Aedeagus, ventral and lateral view **E** Apical part of aedeagus, dorsal view **F** Vaginal palpi **G** Spermatheca **H** Tignum.

Median lobe of aedeagus quite robust and thickened in lateral view. Apical third of median lobe widening evenly. Apical part of median lobe in ventral view narrowing abruptly. Ventral longitudinal groove of median lobe absent in apical part and poorly developed in middle and basal part. Apical denticle of aedeagus in ventral view poorly differentiated, curved ventrally in lateral view. Minute transverse wrinkles on ventral side of median lobe absent. Median lobe in lateral view slightly sinuous near apex. Maximal curvature of median lobe in lateral view situated medially. Width (in middle) to length of median lobe (in ventral view) about: 0.15.

Spermathecal receptacle pear-shaped. Spermathecal pump much shorter than receptacle. Apex of spermathecal pump cylindrical. Spermathecal pump attached to middle of receptacle top. Maximum width of receptacle situated basally. Basal part of receptacle wider than apical. Posterior sclerotization of tignum spoon-shaped, wider than mid section. Anterior sclerotization of tignum narrower than mid section. Apex of vaginal palpus subdeltoid, with lateral side slightly arching. Sides of mid part of vaginal palpus (before apex) narrowing from base, widening towards apex. Anterior sclerotization of vaginal palpus slightly widening anteriorly. Anterior sclerotization of vaginal palpus slightly and evenly curved along length. Anterior end of anterior sclerotization broadly rounded. Length of posterior sclerotization greater than width. Posterior sclerotization about as wide as anterior.

Type materials (preserved in IZCAS). Lectotype (designated here): 1♂, (1) Yangshuo, 21.VIII.1938, (2) Lectotype, *Chaetocnema fortcostata* Chen, 1939, des. Yongying Ruan et al.

Paralectotypes (designated here): 2♂5♀, (1) Yangshuo, 21.VIII.1938, (2) Paralectotype, *Chaetocnema fortcostata* Chen, 1939, des. Yongying Ruan et al.

Materials (all the materials preserved in IZCAS). 19♀14♂, Huoditang, Qinling Mountain, **Shaanxi**, alt.1600m, 6.VI.2013, leg. Yongying Ruan, feed on *Polygonum* sp.; 3, Maoping, Yangxian, Qinling Mountain, **Shaanxi**, alt.701m, 10.VI.2013, leg. Yongying Ruan; 2♂, Longmen River, Xingshan, **Hubei**, alt.1300m, leg. Shimei Song; 6, Longmen River, Xingshan, **Hubei**, 8.IX.1994, alt.1300m, leg. Jian Yao, feed on *Polygonum* sp.; 1♀2♂, Sanxia Linchang, Badong, **Hubei**, 26.VI.1994, alt.130m, leg. Jian Yao; 2♀1♂, Beibei, **Chongqing**, 17.V.1941; 3♂, Longchi, **Sichuan**, IX.29; 1♀2♂, Fengdu, **Sichuan**, alt.200m, 29.IX.1994, leg. Shimei Song; 56, Wangerbao, Wangxian, **Sichuan**, alt.1200m, 4.X.1994, leg. Jian Yao; 1♀1♂, Chudian, Emei Mountain, **Sichuan**, 28.VI.1957, leg. Fuxing Zhu; 1♀, Tienmo Shan, **Zhejiang**, 20.IX.1953; 24, Shanmuhe, **Hunan**, alt.600, 14.VIII.1988, leg. Shuyong Wang; 7♀4♂, Xingzi, **Jiangxi**, 1932; 1♀1♂, Shuyang, Fuan, **Fujian**, IV.3013, leg. Yongying Ruan, feed on *Polygonum* sp.; 5♀2♂, Sangxiang, Xingcun, Chongan, **Fujian**, alt.740m, 7.VI.1960, leg. Yong Zuo; 187, Baijixun, Weixi, **Yunnan**, alt.1780m, leg. Shuyong Wang, feed on *Polygonum* sp.; 14♀3♂, Xiaomengyang, **Yunnan**, alt.900m, III-IV.1957, leg. Shuyong Wang; 1♂, Damenglong, Xishuangbanna, **Yunnan**, alt.650m, 6.X.1958, leg. Zhizhi Chen.

Remarks. There is no holotype or paratype in the IZCAS. But we found eight specimens belonging to what looks like a type series of this species labeled as “*C. fortcostata* sp. n.” with Chen’s handwriting. The locality on the label corresponds with the original description. Therefore we consider these eight specimens as the syntypes. Here we designate one male as the lectotype and the remaining seven as paralectotypes.

This species only occurs in the Oriental China while the northernmost specimens were found on the southern slopes of Qinling Mountain, which is considered as a border between Palearctic and Oriental Regions within China (Chen 1997; Yang 2005).

***Chaetocnema (Chaetocnema) cheni* Ruan, Konstantinov & Yang, sp. n.**

<http://zoobank.org/3584CDFS-3ACE-4FED-9114-BC746DFEC8B6>

http://species-id.net/wiki/Chaetocnema_cheni

Fig. 3

Etymology. We dedicate this species to SH Chen, who originally designated it as new, but left it unpublished. Professor Chen was a classic Chinese entomologist, he laid the foundation for studies of leaf beetles in China.

Distribution. Hunan, Jiangxi, Sichuan, Yunnan.

Host plants. *Solanum tuberosum* Linn. (Solanaceae).

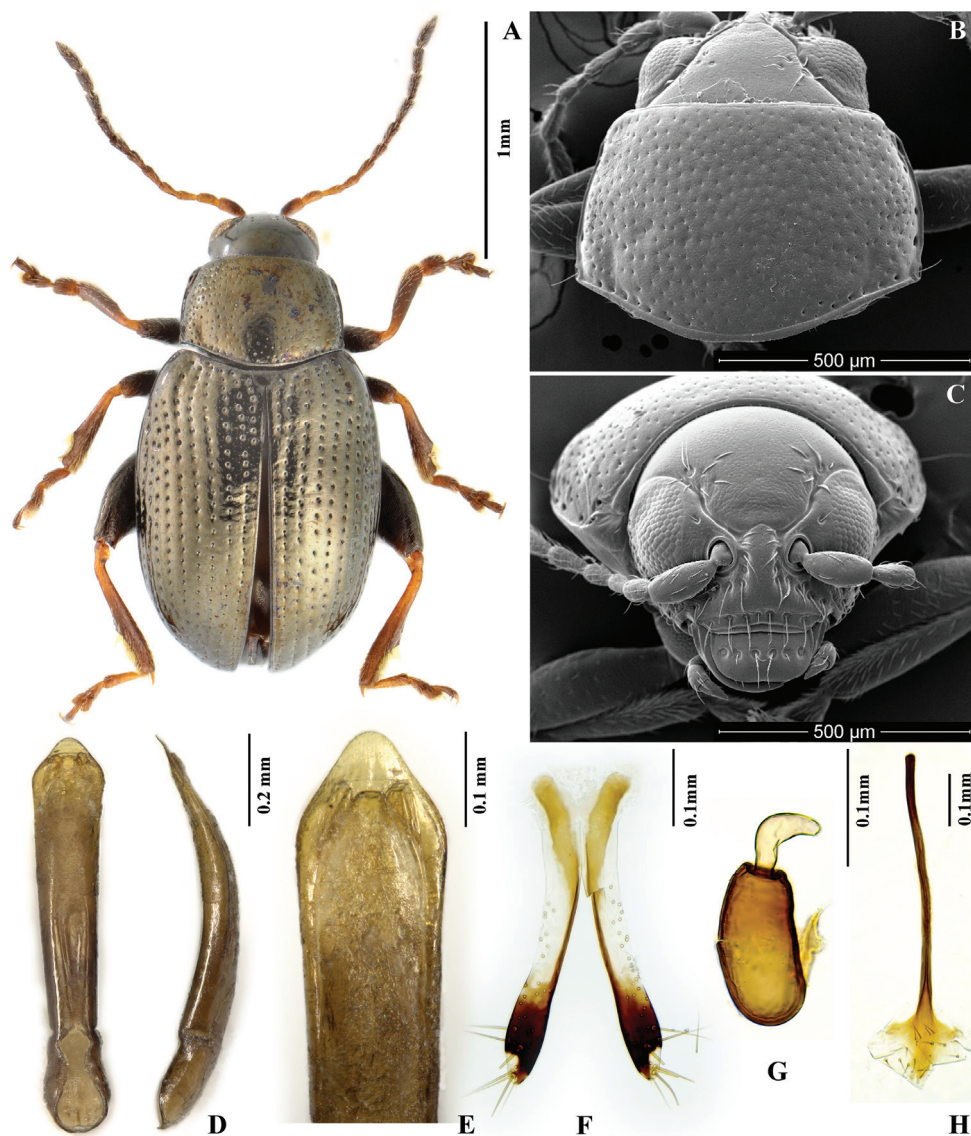
Diagnosis. *Chaetocnema cheni* sp. n. can be differentiated from *C. kingpinensis* sp. n. and *C. constricta* sp. n. by the following characters: first male protarsomere clearly larger than second, appendages darker in color, anterolateral angles of pronotum round. *Chaetocnema cheni* can be differentiated from *C. picipes* and *C. forticostata* based on the following characters: metatibia proximad to denticle in dorsal view convex, apex of aedeagus subdeltoid, tip of aedeagus widely rounded.

Description. MBL = 1.85–2.05 mm; MBH = 1.79–1.93 mm; FBL = 2.10±0.05 mm; FBH = 2.05±0.05 mm; AL/BL = 0.60–0.61; MBW = 1.04–1.06; EL/EW = 1.29; PW/PL = 1.47±0.05; EL/PL = 2.91±0.05; EWB/PWB = 1.17±0.05; EWM/PWM = 1.53±0.05.

Color of elytra usually same with or slightly different from pronotum. Color of elytra copperish, sometimes bluish black. Color of pronotum copperish, sometimes bronzy. Head dorsally copperish, sometimes bluish black. Antennomere 1 partly dark brown. Antennomeres 2–3 yellow. Antennomeres 4–5 partly brown. Remaining antennomeres black. Pro- and mesofemora brown with yellow apex. Metafemora brown. Tarsi brown with yellow on base of each tarsomere.

Head hypognathous. Frontal ridge between antennal sockets narrow and convex. Frontolateral sulcus present. Suprafrontal sulcus shallow and faint or deep laterally, shallow in middle. Suprafrontal sulcus slightly concave. Orbital sulcus (above antennal socket) deep. Width of frontal ridge to width of antennal socket: 1.19±0.05. Width of orbital sulcus (above antennal socket) to width of frontolateral sulcus: 0.64–0.67. Surface of vertex sparsely and unevenly covered with 6–7 punctures close to each eye. Numbers of punctures on orbit on each side: 1. Numbers of setae along frontolateral sulcus on each side: 9–10. Numbers of setae on frons (triangular area surrounded by frontolateral sulcus and clypeus): 0. Numbers of setae on clypeus: 7. Numbers of setae on labrum: 6. Anterior margin of labrum slightly concave in middle.

Base of pronotum with two short, obscure longitudinal impressions near basal margin. Longitudinal impressions lack punctures. Deep row of large punctures at base of pronotum present on sides, lacking in middle. Shape of pronotal base evenly convex. Anterolateral prothoracic callosity protruding laterally but poorly developed. Posterolateral prothoracic callosity projects up to lateral margin of pronotum. Diameter of pronotal punctures 2 to 4 times smaller than distance between them.



Figures 3. *C. cheni*. **A** Holotype, habitus **B** Pronotum **C** Head **D** Aedeagus, ventral and lateral view **E** Apical part of aedeagus, dorsal view **F** Vaginal palpi **G** Spermatheca **H** Tignum.

Elytra with convex sides. All rows of punctures on elytron regular and single. Elytral humeral calli well developed. Interspaces of puncture rows smooth and glabrous. Numbers of minute punctures lines on each interspace: 2.

First male protarsomere distinctly larger than second. First male protarsomere, length to width ratio: 1.50 ± 0.05 . First and second male protarsomeres, length to

length ratio: 1.69 ± 0.05 , width to width ratio: 1.23 ± 0.05 . First male protarsomere, width at apex to width at base: 1.87–2.00. Length of metatibia to distance between denticle and metatibial apex: 2.34–2.47. Large lateral denticle on metatibia sharp. Metatibial serration proximal to large lateral denticle present, obtuse. Metatibia proximal to denticle in dorsal view convex. First male metatarsomere, length to width ratio: 2.47–2.68. First and second male metatarsomeres, length to length ratio: 1.58–1.62. First and second male metatarsomeres, width to width ratio: 0.92–1.00. Third and fourth male metatarsomeres, length to length ratio: 0.71 ± 0.05 . Metatibia length to the metafemora length: 0.76 ± 0.05 .

Median lobe of aedeagus widening gradually towards apex. Apical part of median lobe in ventral view narrowing abruptly forming a subdeltoid apex. Ventral surface of median lobe lateral to median groove apically convex. Ventral longitudinal groove absent in apical and middle part, shallow in basal. Apical denticle of aedeagus in ventral view absent. Apical part of aedeagus in lateral view slightly curved ventrally. Minute transverse wrinkles on ventral side of median lobe absent. Median lobe in lateral view slightly sinusoidal near apex. Median lobe narrow in lateral view. Maximal curvature of median lobe in lateral view situated medially. Width (in middle) to length of median lobe (in ventral view) about: 0.14.

Spermathecal receptacle pear-shaped. Spermathecal pump much shorter than receptacle. Apex of spermathecal pump cylindrical. Spermathecal pump attached to middle of receptacle top. Maximum width of receptacle situated basally. Basal part of receptacle wider than apical. Posterior sclerotization of tignum spoon-shaped, wider than mid section. Anterior sclerotization of tignum wider than mid section. Apex of vaginal palpus subdeltoid, with lateral side slightly arching. Sides of mid part of vaginal palpus (before apex) narrowing from base, slightly widening towards apex. Anterior sclerotization of vaginal palpus slightly widening anteriorly, slightly and evenly curved along length. Anterior end of anterior sclerotization nearly flat. Length of posterior sclerotization greater than width. Width of posterior sclerotization greater to anterior sclerotization.

Type materials (all the materials preserved in IZCAS): Holotype: 1♂ (Fig. 3: A), Longling, **Yunnan**, alt.1600m, 1955.V.20, leg. B. Попов (B. Popov). Paratypes: 2♀1♂, Tianping Mountain, Sangzhi, **Hunan**, alt.1370, 1988.VIII.15, leg. Shuyong Wang; 3♀1♂, Jiujiang, **Jiangxi**, 1958.VII-VIII; 2♀, Jiujiang, **Jiangxi**, 1948.VII; 2♀4♂, Jinfou Mountain, **Sichuang**, 1945.VIII.16, leg. Shuyong Wang; 20, Liziping, Wushan, **Sichuan**, alt.1850m, 1993.V.18-19, leg. Youwei Zhang; 4♂5♀, Liziping, Wushan, **Sichuan**, alt.1850m, 1993.VIII.5-6, leg. Xingke Yang, feed on *Solanum tuberosum* Linn.; 1♂, Jinpinghe, **Yunnan**, alt.1700m, 1956.V.14, leg. Keren Huang.

Remarks. There is a noticeable variability in body color among studied specimens. The holotype collected from Longling, Yunnan province is copperish in color, but the paratypes from Jinfou Mountain, Sichuang Province have greenish-bronzish pronotum and blue-blackish elytra.

***Chaetocnema (Chaetocnema) constricta* Ruan, Konstantinov & Yang, sp. n.**

<http://zoobank.org/22CDA31D-F5B5-4207-895A-DCC97EEDE3DF>

http://species-id.net/wiki/Chaetocnema_constricta

Fig. 4

Etymology. The name of this species is based on a tiny and tight beetle body.

Distribution. Anhui, Sichuan, Chongqing, Guizhou, Zhejiang, Jiangsu, Jiangxi, Fujian, Yunnan, Guangxi.

Host plants. *Rubus corchorifolius* Linn. f. (Rosaceae), *R. fruticosus* Linn., *Polygonum* sp. (Polygonaceae).

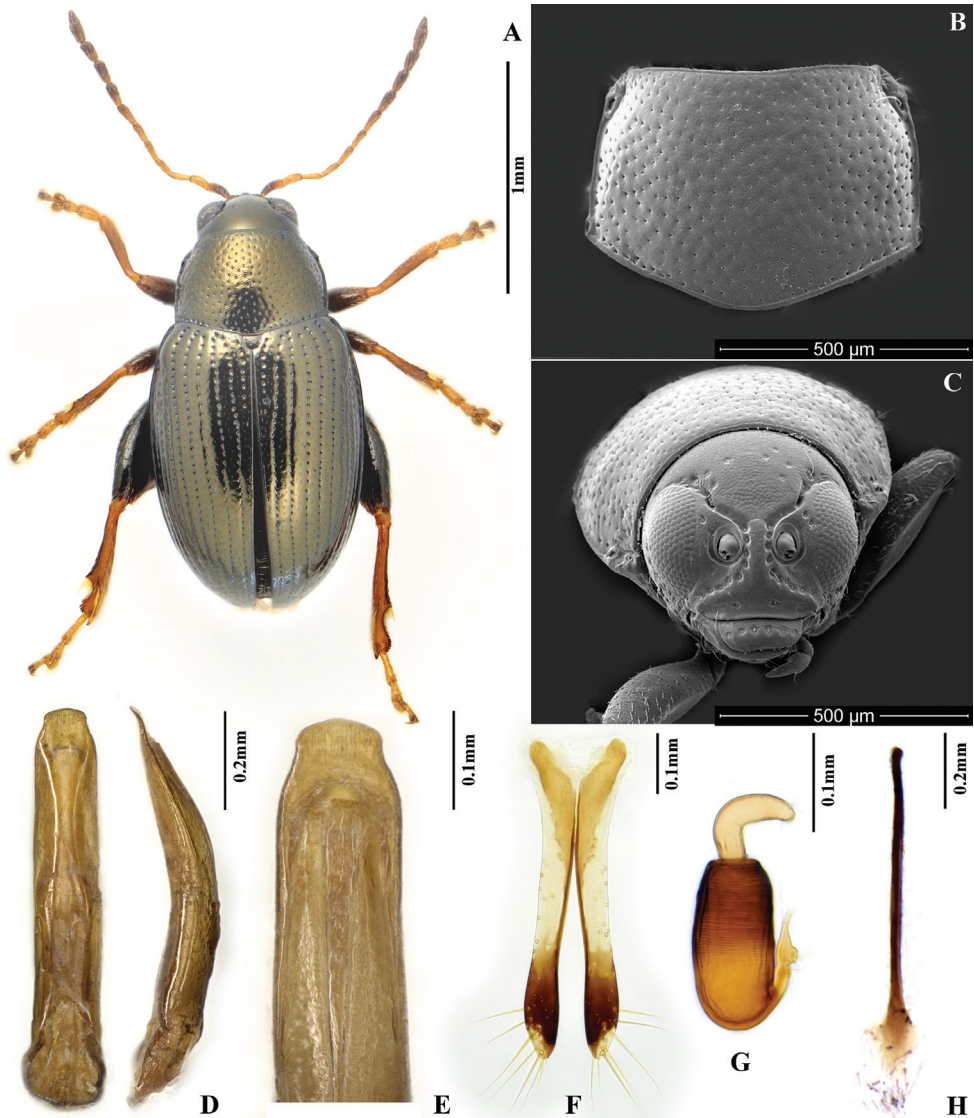
Diagnosis. Body of *Chaetocnema constricta* sp. n. usually tiny and narrow. It can be differentiated from *C. picipes*, *C. fortcostata* sp. n. and *C. cheni* sp. n. by the following characters: first male protarsomere only slightly larger than second, appendages light in color, anterolateral angles of pronotum obtuse and thickened. Exteriorly this species resembles *C. kingpinensis*. But *C. kingpinensis* is larger in body size, having longer appendages and pronotum (relative to body length). If viewed under a soft light, *C. constricta*'s body is entirely bronzish, while *C. kingpinensis* has usually bronzish pronotum and blackish brown elytra.

Description. MBL = 1.71–1.80 mm; MBH = 1.52–1.65 mm; FBL = 2.15–2.31 mm; FBH = 1.88–2.16 mm; AL/BL = 0.61–0.62; MBW = 0.90–0.94; EL/EW = 1.28±0.05; PW/PL = 1.44±0.05; EL/PL = 2.55±0.05; EWB/PWB = 1.13±0.05; EWM/PWM = 1.37±0.05.

Elytra bronzish, exactly same color as pronotum. Head dorsally bronzish. Antennomere 1 partly dark brown. Antennomeres 2–4 yellow. Antennomeres 5–6 yellow with brown apex. Remaining antennomeres brown with yellow base. Pro- and meso- femora brown with yellow apex. Metafemora brown. Tibia mostly yellow, dark at distal half. Tarsi yellow.

Head hypognathous. Frontal ridge between antennal sockets narrow and convex. Frontolateral sulcus present. Suprafrontal sulcus shallow and faint or deep laterally, shallow in middle. Suprafrontal sulcus slightly concave. Orbital sulcus (above the antennal socket) very deep. Orbital sulcus forming an obvious narrow deep concave above orbit. Width of frontal ridge to width of antennal socket: 0.70–0.75. Width of orbital sulcus (above antennal socket) to width of frontolateral sulcus: 1.20–1.45. Surface of vertex sparsely and unevenly covered with 5–6 punctures on each side close to eye. Numbers of punctures on orbit on each side: 1–2. Numbers of setae along frontolateral sulcus on each side: 9–10. Numbers of setae on frons (triangular area surrounded by frontolateral sulci and clypeus): 0. Numbers of setae on clypeus: 4. Numbers of setae on labrum: 6. Anterior margin of labrum slightly concave in middle.

Base of pronotum with two short longitudinal impressions visible only near basal margin. Longitudinal impressions lack punctures. Deep row of large punctures at base of pronotum present on sides, lacking in middle. Pronotal base evenly convex. Anterolateral prothoracic callosity has finely developed blunt angle protruding antero-laterally. Posterolateral prothoracic callosity projects beyond lateral margin of pronotum. Diameter of pronotal punctures subequal to distance between them.



Figures 4. *C. constricta*. **A** Holotype, habitus **B** Pronotum **C** Head **D** Aedeagus, ventral and lateral view **E** Apical part of aedeagus, dorsal view **F** Vaginal palpi **G** Spermatheca **H** Tignum.

Elytra with convex sides. Scutellar row of punctures regular and single. Remaining rows regular. Elytral humeral calli well developed. Interspaces of rows of punctures smooth and glabrous. Two lines of minute punctures on each interspace.

First male protarsomere slightly larger than second. First male protarsomere, length to width ratio: 1.90–2.00. First and second male protarsomeres, length to length ratio: 1.60–1.80, width to width ratio: 1.05–1.13. First male protarsomere, width at apex to width at base: 1.70–1.88. Length of metatibia to distance between denticle and

metatibial apex: 2.88–3.04. Large lateral denticle on metatibia sharp. Metatibial serration proximal to large lateral denticle present, obtuse. Metatibia proximate to denticle in dorsal view concave. First male metatarsomere, length to width ratio: 1.86–1.91. First and second male metatarsomeres, length to length ratio: 1.91–1.93, width to width ratio: 0.95–1.07. Third and fourth male metatarsomeres, length to length ratio: 0.59–0.76. Metatibia length to metafemora length: 0.82 ± 0.05 . Length of hind leg to length of body: 0.91 ± 0.05 .

Apical third of median lobe of aedeagus parallel-sided. Apical part of median lobe in ventral view narrowed abruptly and forms big cap on top. Ventral longitudinal groove of median lobe poorly developed, with obtuse margins. Apical part of longitudinal groove as wide as basal. Middle part of longitudinal groove narrower than basal. Apical denticle of aedeagus in ventral view absent. Minute transverse wrinkles on ventral side of median lobe absent. Median lobe in lateral view sinusoidal near apex. Maximal curvature of median lobe in lateral view situated medially. Median lobe thickened in lateral view. Width (in middle) to length of median lobe (ventral view): 0.17.

Spermathecal receptacle pear-shaped and cylindrical. Spermathecal pump much shorter than receptacle. Apex of spermathecal pump cylindrical. Spermathecal pump attached to middle of receptacle top. Basal part of receptacle about as wide as middle and apical parts separately. Posterior sclerotization of tignum spoon-shaped, wider than mid section. Apex of vaginal palpus subdeltoid, with lateral side slightly arching. Sides of mid part of vaginal palpus slightly narrowing from base, and slightly widening towards apex. Anterior sclerotization of vaginal palpus slightly narrowing anteriorly. Anterior end of anterior sclerotization narrowly rounded. Length of posterior sclerotization greater than width. Posterior sclerotization about as wide as anterior sclerotization.

Type materials (all the materials preserved in IZCAS). Holotype: 1♂ (Fig. 4: A), Shuyang, Fuan, **Fujian**, alt.200m, 2013.VIII.12, leg. Yongying Ruan. Paratypes: 30♀20♂, Huangshan, **Anhui**, alt.630m, 18.VIII.1978, leg. Shuyong Wang; 6♀7♂, Shaping, **Sichuan**, 29.XI; 6♀6♂, Ebian, **Sichuan**, X; 1♀, Beibei, **Chongqing**, 11.VI.1940; 6♀3♂, Huaxi **Guizhou**, 8.VI.1980; 6♀1♂, Sanmuping, Tianmu Mountain, **Zhejiang**, 30.VII.1998, leg. Hong Wu; 2♀, Tianmu Mountain, **Zhejiang**, 6.VI.1999, leg. Mingyuan Gao; 3♀1♂, Longwang Mountain, Anji, **Zhejiang**, 1995–1996, leg. Hong Wu; 1♂, Nanjing, **Jiangsu**, 1994, leg. Miao Hu; 20♀8♂, Jiulianshan, **Jiangxi**, 20–23.IX.1978, leg. Peiyu Yu, feed on *Rubus* sp.; 1♂2♀, Dazhulan, **Fujian**, 15–20.VI.1948; 5♀, Wuyi Mountain, **Fujian**, alt.500–1100m, V.1997, leg. Jiashe Wang; 1♀, Wuyi Mountain, **Fujian**, alt.1200m, 1997.VII, leg. Jiashe Wang; 83♀30♂, Wuyi Mountain, **Fujian**, 5–26.V.1997, leg. Jiashe Wang; 1♀2♂, Nanping, **Fujian**, 22.VII.1957, leg. Jiashe Wang; 1♂, Aotou, Huangkeng, Jianyang, **Fujian**, alt.750–950m, 3.VI.1997, leg. Yong Zuo; 1♀, Longling, **Yunnan**, alt.1600m, 20.V.1995, leg. Zifeng Xue; 1♂, Fangcheng, **Guangxi**, alt.650m, 14.III.1998, leg. Gexia Qiao; 10♀8♂, Jinxiu, **Guangxi**, alt.600m, V.1999, leg. Mingyuan Gao; 5♀2♂, Yanshan, Guilin, **Guangxi**, 15.VI.1963, leg. Shuyong Wang; 1♂, Tianping Mountain, Longsheng, **Guangxi**, 9.VI.1963, leg. Shuyong Wang; 17♀10♂, Yaoshan, Xiuren, **Guangxi**, 6.V.1938.

***Chaetocnema* (*Chaetocnema*) *kingpinensis* Ruan, Konstantinov & Yang, sp. n.**

<http://zoobank.org/2CD2550A-3AE9-4FA8-8658-10E855D21461>

http://species-id.net/wiki/Chaetocnema_kingpinensis

Fig. 5

Chaetocnema (*Tlanoma*) *kingpinensis* Chen (MS), in Wang 1992: 681.

Etymology. We named this species after a place called “Kingpin” in Yunnan province where some specimens of this species were collected.

Distribution. Jiangxi, Yunnan, Guangxi.

Host plants. *Rubus* sp. (Rosaceae).

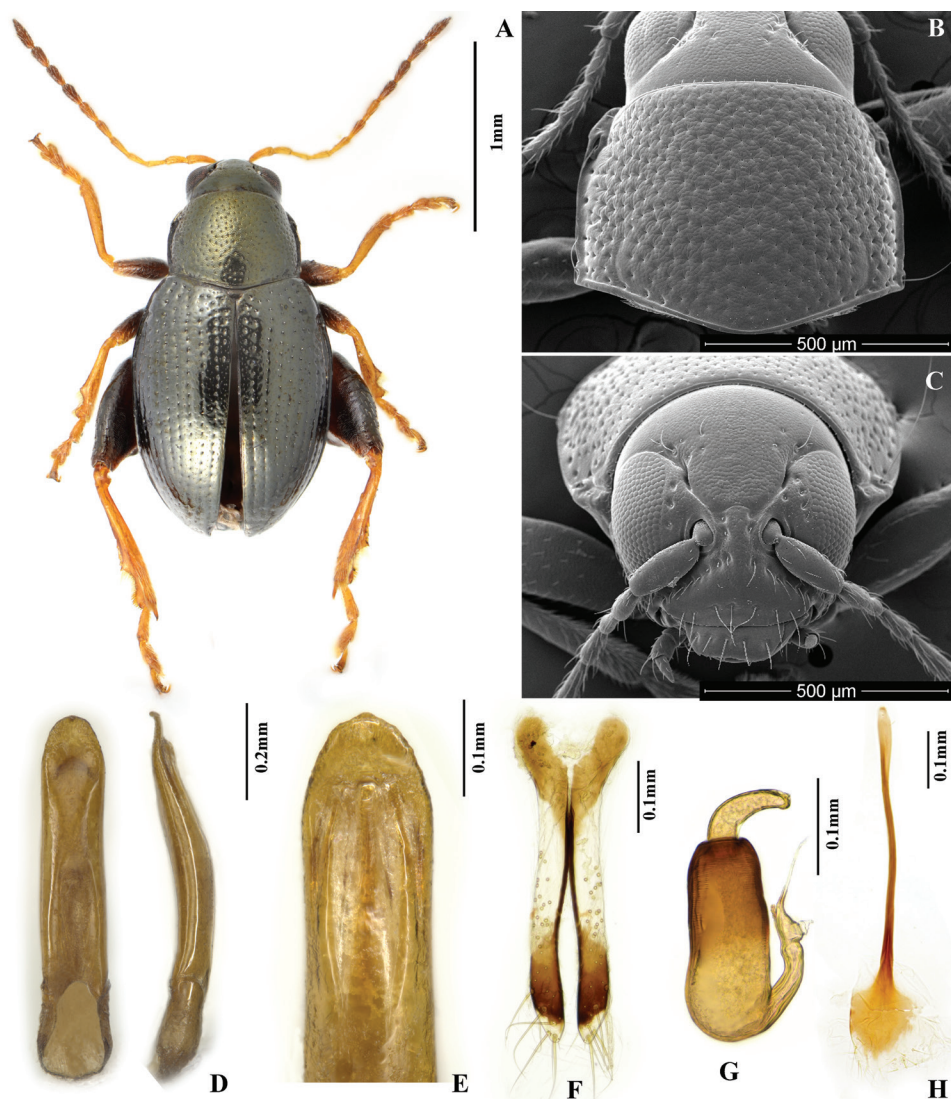
Diagnosis. Body of *Chaetocnema kingpinensis* sp. n. quite narrow. It can be differentiated from *C. picipes*, *C. fortcostata* sp. n. and *C. cheni* sp. n. by the following characters: first male protarsomere only slightly larger than second, appendages light in color, anterolateral angles of pronotum obtuse and thickened. This species resembles *C. constricta* exteriorly. But *C. kingpinensis* is larger in body size, with longer appendages and pronotum (relative to body length). If viewed under a soft light, *C. constricta* appears entirely bronze, while *C. kingpinensis* usually has bronzish pronotum and blackish brown elytra.

Description. MBL = 1.80–2.54 mm; MBH = 1.66–2.40 mm; FBL = 2.11–2.64 mm; FBH = 1.80–2.45 mm; AL/BL = 0.70; MBW = 0.89–1.04; EL/EW = 1.29–1.29; PW/PL = 1.32; EL/PL = 1.87; EWB/PWB = 1.14; EWM/PWM = 1.45–1.45.

Color of elytra usually differs from color of pronotum. Elytra often brown to black, sometimes bronzish. Pronotum bronzish. Head dorsally dark bronzish. Antennomere 1 yellow but darker than antennomeres 2–5. Antennomeres 2–5 yellow. Antennomeres 6–7 partly brown. Antennomeres 8–11 brown with yellow at base. Tibiae yellow, tarsomeres yellow with claw segment brown at apex. Pro- and mesofemora light brown with yellow apex. Metafemora brown.

Head hypognathous. Frontal ridge between antennal sockets narrow and convex. Frontolateral sulcus present. Suprafrontal sulcus shallow and faint or deep laterally, shallow in middle. Suprafrontal sulcus slightly concave. Orbital sulcus (above antennal socket) deep. Width of frontal ridge to width of antennal socket: 0.84–0.88. Width of orbital sulcus (above antennal socket) to width of frontolateral sulcus: 0.93–1.16. Surface of vertex sparsely and unevenly covered with 5–6 punctures close to each eye. Numbers of punctures on orbit on each side: 3–5. Numbers of setae along frontolateral sulcus on each side: 8–10. Numbers of setae on frons (triangular area surrounded by frontolateral sulcus and clypeus): 0. Numbers of setae on clypeus: 7. Numbers of setae on labrum: 6. Anterior margin of labrum slightly concave in middle.

Base of pronotum with two short longitudinal impressions without punctures visible only near basal margin. Deep row of large punctures at base of pronotum present on sides, lacking in middle. Pronotal base evenly convex. Lateral sides of pronotum thickened, only slightly convex with maximum width near base. Pronotum quite convex from lateral view. Anterolateral prothoracic callosity protruding antero-laterally,



Figures 5. *C. kingpinensis*. **A** Holotype, habitus **B** Pronotum **C** Head **D** Aedeagus, ventral and lateral view **E** Apical part of aedeagus, dorsal view **F** Vaginal palpi **G** Spermatheca **H** Tignum.

forms strong obtuse angle. Posterolateral prothoracic callosity projects beyond lateral margin of pronotum. Setae on each callosity long, exceeding half of pronotal length. Wrinkles between punctures on pronotum well developed. Diameter of pronotal punctures subequal to distance between them.

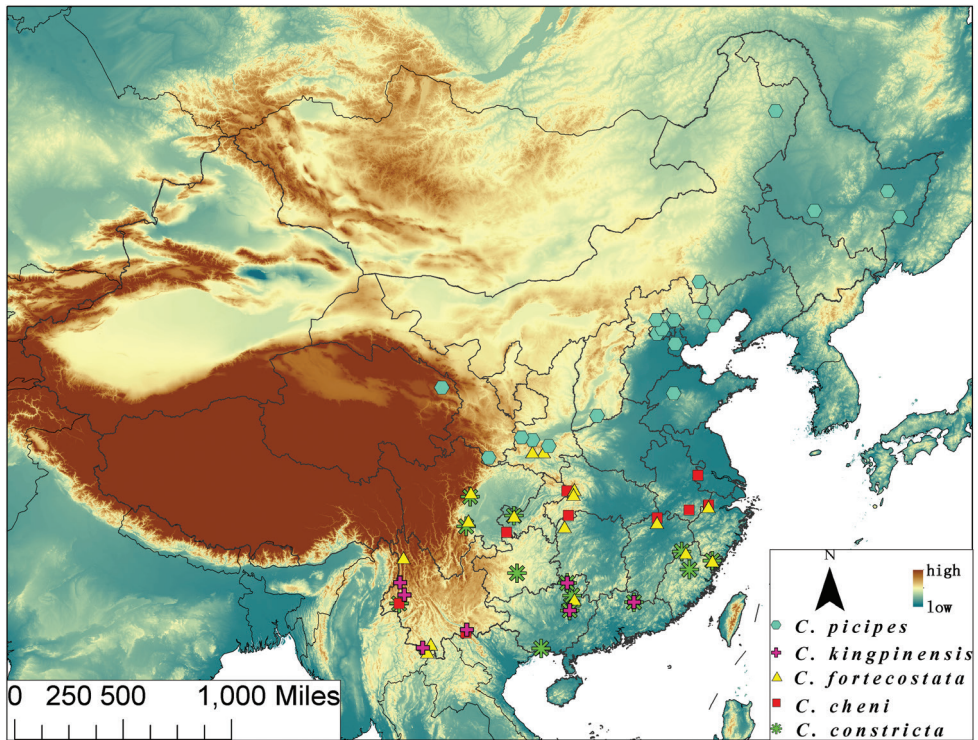
Elytra with convex sides. Scutellar row of punctures regular and single. All other rows of punctures regular. Elytral humeral calli well developed. Interspaces between rows of punctures on elytra smooth and glabrous. Numbers of minute punctures lines on each interspace: 2.

First male protarsomere only slightly larger than second. First male protarsomere, length to width ratio: 1.95–2.03. First and second male protarsomeres, length to length ratio: 1.43–1.52, width to width ratio: 0.89–0.91. First male protarsomere, width at apex to width at base: 1.45–1.55. Length of metatibia to distance between denticle and metatibial apex: 2.73–2.95. Large lateral denticle on metatibia sharp. Metatibial serration proximal to large lateral denticle present, obtuse. Metatibia proximad to denticle in dorsal view concave. First male metatarsomere, length to width ratio: 2.78–2.85. First and second male metatarsomeres, length to length ratio: 1.80–1.90, width to width ratio: 0.92–0.96. Third and fourth male metatarsomeres, length to length ratio: 0.62–0.71. Metatibia length to metafemora length about: 0.89. Length of hind leg to length of body about: 1.04.

Apical third of median lobe of aedeagus parallel-sided. Apical part of median lobe in ventral view narrowing abruptly. Ventral longitudinal groove of median lobe poorly developed in apical and basal part, narrow or absent in middle part. Apical part of longitudinal groove as wide as basal. Apical denticle of aedeagus in ventral view poorly differentiated. Apical denticle of aedeagus in lateral view strongly curved ventrally. Minute transverse wrinkles absent on ventral side of median lobe. Median lobe in lateral view slightly sinusoidal near apex. Maximal curvature of median lobe in lateral view situated medially. Width (in middle) to length of median lobe (in ventral view) about: 0.18. Median lobe narrow in lateral view.

Spermathecal receptacle pear-shaped, slightly narrow in middle. Spermathecal pump much shorter than receptacle. Apex of spermathecal pump cylindrical. Spermathecal pump attached to middle of receptacle top. Maximum width of receptacle situated basally. Basal part of receptacle wider than apical. Posterior sclerotization of tignum spoon-shaped, wider than mid section. Mid section of tignum nearly straight. Anterior sclerotization of tignum wider than mid section. Apex of vaginal palpus subdeltoid, with lateral side slightly arching. Sides of mid part of vaginal palpus (before apex) narrowing from base, slightly widening towards apex. Anterior sclerotization of vaginal palpus slightly narrowing anteriorly. Anterior sclerotization of vaginal palpus slightly and evenly curved along length. Anterior end of anterior sclerotization broadly rounded. Length of posterior sclerotization greater than width. Posterior sclerotization about as wide as anterior sclerotization.

Type materials (all the materials preserved in IZCAS). Holotype: 1♂ (Fig. 5: A), Lushui, **Yunnan**, alt.1900m, 8.VI.1981, leg. Shuyong Wang, feed on *Rubus* sp. 2♀1♂, Jiulianshan national reserve, **Jiangxi**, 8.IX.1978, leg. Youjiao Liu; Paratypes: 16♀11♂, Lushui, **Yunnan**, alt.1900m, 8.VI.1981, leg. Shuyong Wang, feed on *Rubus* sp.; 8♀4♂, Changpotou, Jingping, **Yunnan**, 22.V.1952, leg. Keren Huang et al., feed on *Rubus* sp.; 1♂, Hetouzhai, Jinping, **Yunnan**, alt.2000m, 22.V.1952, leg. Keren Huang et al.; 1♂, Baoshan, **Yunnan**, alt.1600m, 13.V.1955, leg. Bu-xi-ke & Le Wu.; 2♂, Menghun, Menghai, Xishuangbanna, **Yunnan**, alt.1200-1400m, 20-23.V.1958; 1♂, Tiantanshan, Jinxiu, **Guangxi**, alt.600m, 11.V.1999, leg. Mingyuan Gao; 4♀4♂, Tianping Mountain, Longsheng, **Guangxi**, 9.VI.1963, leg. Shuyong Wang; 1♂, Tianping Mountain, Longsheng, **Guangxi**, 740m, feed on *Rubus* sp. 4♀4♂, Tian-



Figures 6. Map of continental China, illustrating localities for distribution of species. *C. picipes*=blue hexagons; *C. kingpinensis* = purple crosses; *C. fortcostata* = yellow triangles; *C. cheni* =red squares; *C. constricta* =green stars.

ping Mountain, Longsheng, **Guangxi**, 9.VI.1963, leg. Shuyong Wang; 1♂, Tianping Mountain, Longsheng, **Guangxi**, 740m, feed on *Rubus* sp.

Remarks. This species was originally recognized as new by SH Chen. A series of paratypes were found in the IZCAS collection, but we did not find the holotype. The species was briefly mentioned by Wang (1992). However its name remained unavailable according to the rules of the “International Code of Zoological Nomenclature” (fourth edition). Hence we provide a description for this species keeping the name proposed by Chen.

The specimens of this species collected from Tianping Mountain are extremely large. One male from Guanxi, is 2.54 mm long, and female can be as long as 2.64 mm.

Distribution pattern of species of Chinese *Chaetocnema picipes* species-group

Qinling Mountain, considered as a border between Palearctic and Oriental Regions within China (Chen 1997; Yang 2005) seems a natural barrier which separate the Palearctic species from the Oriental ones. It is also applicable in this species-group. *C. picipes* is distributed only in the Palearctic part of China while *C. fortcostata* is distrib-

uted only in Oriental China. It is interesting that some of the southernmost specimens of *C. picipes* were collected from several places from the north slope of Qinling Mountain but none from the south slope. The northernmost specimens of *C. fortcostata* we found are from the southern slopes of Qinling Mountain.

C. cheni sp. n. seems to be a species in the transition area between Oriental and Palaearctic Region, however *C. fortcostata*, *C. constricta* and *C. kingpinensis* are the Oriental ones.

Acknowledgement

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Four new species of *Cymatodera* Gray from Mexico (Coleoptera, Cleridae, Tillinae)

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Abstract

Four new species of *Cymatodera* from Mexico: *Cymatodera bogcioides* **sp. n.**; *Cymatodera pueblae* **sp. n.**; *Cymatodera mitae* **sp. n.**; and *Cymatodera lineata* **sp. n.** are described based on adult male and female specimens. Male genitalia and other characters of taxonomic value are presented.

Keywords

Cymatodera, terminalia, genitalia, antennae, Mexico, checkered beetle

Introduction

Cymatodera, a group of checkered beetles composed of generalist predators, represents one of the largest genera of North and Central American Cleridae (Barr 1972). The genus has never been revised and much descriptive work at the species level needs to be done. Most described species are known from the southwest United States (Corporaal 1950; Barr 1952), which may be an artifact of uneven collecting. Moreover, the area encompassed by Mexico, especially the central and southern portion of the country, are areas where faunal surveys have been infrequent. Geographically, the terrain of Mexico is very heterogeneous, with a wide array of ecological niches and climates. This cluster of habitats is accompanied by a considerable diversity of organisms, and a number of species of clerids undoubtedly remain to be described from these areas.

Research in progress on *Cymatodera* from Mexico, which includes localities and data from ~6,000 specimens collected throughout the Americas and revised by the first author, indicates 62 described species present in Mexico. This number is far greater than the 27 species previously provided by Barr (unpublished checklist) and the 15 species listed by Vaurie (1952). Recent work by Rifkind et al. (2010) and Burke (2013) added 8 new species to the Mexican and Central American *Cymatodera* fauna. This paper describes four new species of *Cymatodera* restricted to Mexico.

Methods

Genitalia extraction and dissection procedures are similar to those outlined by Ekis (1977). Much of the morphological terminology follows the work of Ekis (1977), Rifkind (1996) and Opitz (2010). Male genitalia was considered as a key character for the determination of new species.

Specimens were observed using a Leica MZ APO stereomicroscope. All measurements were made using a stereomicroscope ocular micrometer and the software Leica Application Suite v3.4.0. Images were taken using a Leica DFC 500 digital camera and stacked using Auto-Montage v4.00 by Synoptics Ltd.

The following abbreviations are used in the description of the holotypes: TL= Total body length, HW= Maximum head width, HL= Head length, PW= Maximum pronotal width, PL= Pronotal length, EW= Maximum elytral width, EL= Elytral length.

Type material is deposited in the following collections:

CASC	California Academy of Science Collection, San Francisco, CA, USA
CNIN	Colección Nacional de Insectos, Instituto de Biología, UNAM, DF, México
FSCA	Florida State Collection of Arthropods, Gainesville, FL, USA
JEWC	James E. Wappes Collection, San Antonio, TX, USA
JNRC	Jacques Rifkind Collection, Valley Village, CA, USA
RFMC	Roy F. Morris Collection, Lakeland, FL, USA
WFBM	William F. Barr Museum, University of Idaho, Moscow, ID, USA

Descriptions

Cymatodera bogcioides Burke, sp. n.

<http://zoobank.org/34599650-FB03-43C7-B870-9F199A1AF300>

http://species-id.net/wiki/Cymatodera_bogcioides

Figs 1, 6, 11, 16, 17, 26, 30, 31

Type material. Holotype: male, Mexico, Jalisco, Careyes, Hotel Costa Careyes, 7-VII-1991, tropical deciduous forest, at light, J. Rifkind and P. Gum, printed red label, holotype deposited in CASC. **Paratypes:** 3 males and 2 females. 1 male and 1 female:

same data as holotype except male collected 4-7-VII-1991 and female collected 6-7-VII-1991 (JNRC); 1 male: Mexico, Jalisco, Estacion Biologica Chamela, 10-20-VII-1985, E. Giesbert (FSCA); 1 male: Mexico, Jalisco, Estacion de Biologia Chamela, UNAM, 14-IX-1993, Black light, Morris, Huether and Wappes, (RFMC); 1 female: Mexico, Jalisco, vic. Chamela UNAM, 19-IX-1993, J. E. Wappes (JEWG).

Differential diagnosis. Males of *Cymatodera bogcioides* are characterized by the presence of a broad, rather deep carina that extends transversely on the first visible ventrite (Fig. 30). *Bogcia oaxacae* Barr, *Cymatodera limatula* Burke, and *C. obliquefasciata* Schaeffer also have a transversal carina on the first visible ventrite and similar antennae. From these, *C. bogcioides* is most similar to the sympatric *B. oaxacae* (Fig. 5) and can be distinguished from *B. oaxacae* by the shape of antennomeres 4–11 (Figs 6, 10). *Cymatodera bogcioides* has the antennomeres 4–10 longer than broad and the posterior distal angle of these is somewhat blunt or rounded, the last antennomere is longer than the ninth and tenth antennomeres, and its distal margin is compressed medially (Fig. 6). *Bogcia oaxacae* has antennomeres 4–10 as broad as long and the posterior distal angle sharply pointed, and the last antennomere is about the same length as the tenth antennomere, with its distal margin moderately oblique (Fig. 10). Differences in the protarsal unguis and abdominal segments are also evident for these species. The position of the protarsal claw is very close to the denticle in *B. oaxacae*, but conspicuously separated in *C. bogcioides*. In addition, the male of *C. bogcioides* has the posterior margin of the sixth visible ventrite moderately emarginate (Fig. 16), and the posterior margin of the sixth tergite broadly rounded (Fig. 17), while the male of *B. oaxacae* has the posterior margin of the sixth visible ventrite and sixth tergite narrowly truncate (Figs 24–25). The female terminalia of these two species is very similar (Figs 26, 29); as a result, identification of the female of *C. bogcioides* is only possible in combination with male specimens. Likewise, differences in the male genitalia are also apparent for these species. *Cymatodera bogcioides* has the lateral margin of the tegmen triangular, with the parameres moderately developed (Fig. 11) while *B. oaxacae* has the lateral margins of the tegmen subparallel with the anterior 1/3 strongly oblique, and the parameres are poorly developed (Fig. 15).

Description. Holotype. Medium-sized, rather robust, posterior wings fully developed, TL= 12.75 mm. Color: Head, pronotum, prosternum, mesosternum and metasternum ferruginous, remainder of body uniformly brown. Each elytron with two pairs of dark maculae, the first pair dark brown, located on the humeral angles, the second pair on the median region of the elytral ground, this pair extends from the second to the fifth stria (Fig. 1).

Head: HL= 1.2 mm, HW= 2.2 mm. Measured across eyes wider than pronotum; finely, moderately punctate, vested with semirecumbent setae; surface slightly rugose; frons moderately bi-impressed; eyes large, feebly emarginate in front, rounded, bulging laterally, separated by approximately 1.2 eye-widths. Antennae loosely composed, extending slightly beyond elytral base; third antennomere 2.0× longer than second antennomere, antennomeres 4–10 subequal in length, longer than broad, strongly serrate; blunt at posterolateral portion; last antennomere 2.1× longer than tenth antennomere (Fig. 6).



Figures 1–5. Habitus of: **1** *Cymatodera bogcioides* (holotype male) **2** *Cymatodera pueblae* sp. n. (holotype male) **3** *Cymatodera mitae* sp. n. (holotype male) **4** *Cymatodera lineata* sp. n. (holotype male) **5** *Bogcia oaxacae* (male). Scale bars = 1 mm.

Thorax: PL= 2.75 mm, PW= 1.85 mm. Pronotum widest at middle; sides constricted subapically, more strongly constricted behind middle; disc flat, not constricted in front of middle; moderately vested with short, semirecumbent setae intermixed with less numerous, semierect setae; surface rather rugose, rugosity becoming more apparent on sides; moderately punctate, punctation somewhat shallow and less numer-

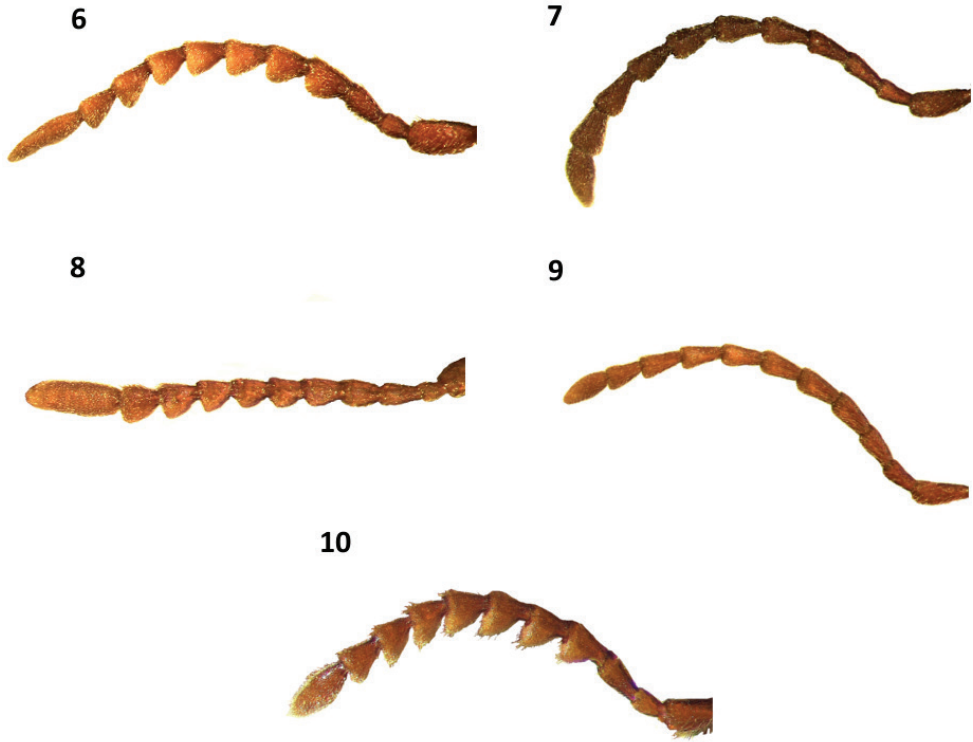
ous on disk; subbasal tumescence feebly indicated. Prosternum smooth, very feebly punctulate, slightly rugose. Mesosternum moderately, coarsely punctate; scarcely vested with fine, recumbent setae. Metasternum convex; moderately, finely punctate; mesal area with a longitudinal sulcus; covered with fine, recumbent setae.

Legs: Clothed with semirecumbent, semierect, and erect setae of various sizes; femora moderately, shallowly punctulate, rugulose; tibia moderately, shallowly punctate, rugose; fourth protarsomere with pulvillus medially incised, incision does not extend beyond apical fourth.

Elytra: EL= 7.7 mm, EW= 3.5 mm; broader than pronotum; humeri indicated, rounded; sides subparallel; widest behind middle; disc flattened above; surface shiny, slightly rugose; apices subquadrate; moderately dehiscent; elytral declivity moderately steep; clothed with short, semierect setae intermixed with less numerous, long, semierect and erect setae; sculpture consisting of coarse punctations arranged in regular striae that gradually become smaller and shallower behind posterior 1/4, punctations not reaching elytral apex; interstices at elytral base about 2.5× width of punctation.

Abdomen: Ventrites 1–5 rugose; moderately, finely punctate; clothed with long, fine, recumbent setae. First ventrite convex; subquadrate; posterior margin conspicuously elevated with a transverse carina originating next to posterolateral angles producing a broad, deep, arcuate emargination (Fig. 30). Second visible ventrite somewhat convex; subquadrate; posterior margin slightly elevated with a longitudinal carina producing a moderately broad, rather deep, arcuate emargination. Ventrites 3–4 convex; subquadrate; posterior margin truncate. Fifth visible ventrite convex; lateral margins oblique; posterior margin broadly, deeply emarginate, emargination extending to posterior third of its length; hind angles rounded (Fig. 16). Sixth ventrite subtriangular; surface rugulose; feebly convex; broader than long; lateral margins feebly arcuate, strongly oblique; posterolateral angles rounded; posterior margin broadly, very feebly, shallowly emarginate. Fifth tergite convex; surface rugulose; subquadrate; posterior margin very feebly, narrowly emarginate (Fig. 17). Sixth tergite feebly convex; semicircular; lateral and posterior margins broadly rounded. Sixth tergite extending beyond apical margin of sixth visible ventrite, fully covering sixth ventrite from dorsal view. Aedeagus: 1.95 mm long; ratio of length of paramere to whole tegmen 0.35: 1; tegmen partially covering phallus; parameres moderately developed, pointed at apex; phallobase wide; phallus with copulatory piece acuminate distally; phallic plate devoid of denticles, finely granulate on posterolateral area; phallobasic apodeme rather long, moderately robust distally; endophallic struts slender throughout length (Fig. 11).

Females in the type series differ from males by having the first visible ventrite moderately longer than males, and ventrites 1–2 posteriorly truncate and lacking the moderately elevated transversal carina (Fig. 31). Other abdominal differences in the female are as follows: fifth visible ventrite rugulose; lateral margins oblique; posterior margin shallowly, moderately broadly emarginate. Sixth visible ventrite semicircular; rugulose; feebly convex; lateral and posterior margins broadly rounded (Fig. 26). Fifth



Figures 6–10. Antennae of: **6** *Cymatodera bogcioides* male **7** *C. pueblae* (male) **8** *C. mitae* (male) **9** *C. lineata* (male) **10** *Bogcia oaxacae* (male).

tergite rugulose; subtriangular; lateral margins oblique; posterior margin shallowly, moderately broadly and triangularly emarginate. Sixth tergite subtriangular; rugulose; broader than long; surface inconspicuously convex; lateral and posterior margins strongly oblique, producing a rather continuous and semicircular margin. Sixth tergite extending beyond sixth visible ventrite.

Variation. Length of males 12.2–14.9 mm, length of females 12.3–15.2 mm; $n = 4$. Length to width ratio of head: males average 0.65, females 0.74. Length to width ratio of thorax: males average 1.53, females average 1.49. Length to width ratio of elytra: males average 2.33, females average 2.39. Two males and one female have a slightly more obscure coloration on the elytral ground, these individuals have the humeral maculae completely black, rather than dark brown, as in the holotype.

Distribution. The type series was collected in two localities close to each other in the western portion of the state of Jalisco, Mexico. The first locality is in Costa Careyes, in the Costalegre region, and the second locality is the UNAM Biological Research Station located in the Chamela-Cuitzmala natural reserve (Fig. 34).

Etymology. The specific epithet refers to the resemblance of this species to *Bogcia oaxacae* and *B. disjuncta*.

***Cymatodera pueblae* Burke, sp. n.**

<http://zoobank.org/712E2AE1-2E06-4BD2-AA67-F557F425FEAA>

http://species-id.net/wiki/Cymatodera_pueblae

Figs 2, 7, 12, 18, 19, 27

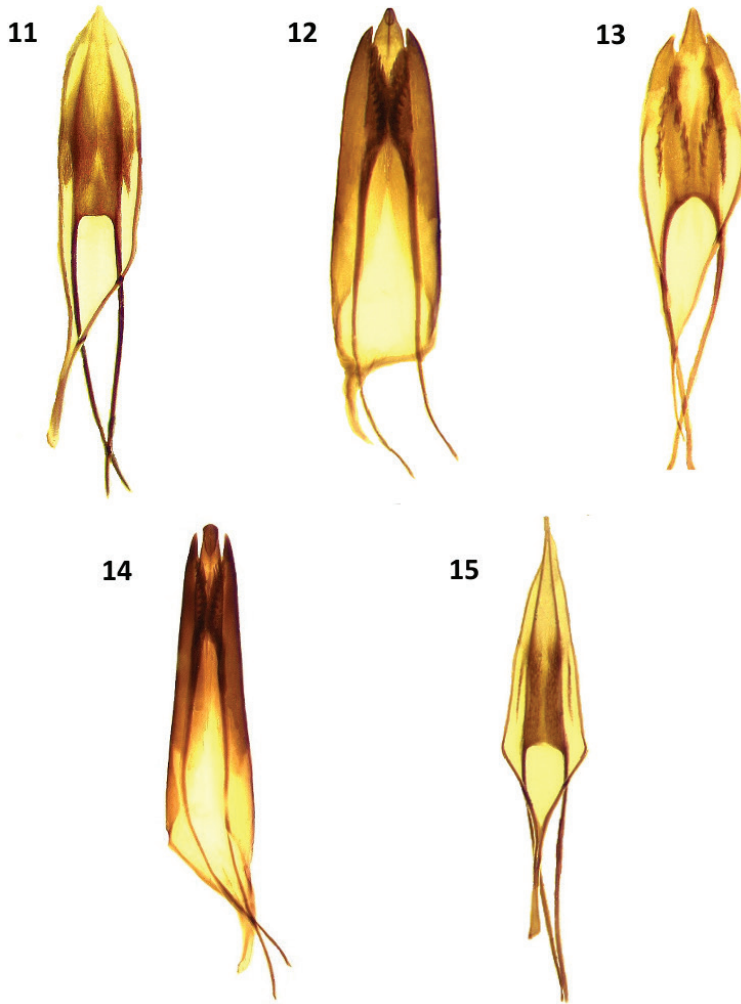
Type material. Holotype: male, Mexico, Puebla, Highway 18, 6 miles S Esperanza, 14-V-1983, 8100 ft, L. O'Brien and G. B. Marshall, printed red label, holotype deposited in CSCA. **Paratypes:** 2 males and 5 females. 1 male: México, Puebla, San Esteban Necoxcalco, 15-X-1992, C. Mayorga (CNIN); 1 male: Mexico, Mexico, km 41 highway Texcoco – Calpulalpan, 2685 m, 19 30 43 N 98 52 40 W, 3-VII-2001, beating oak, R. L. Westcott (JNRC); 1 female: México, Puebla, km 50 Plan de San Miguel, carretera Huajuapán de León - Oaxaca, 14-VIII-1992, C. Mayorga and E. Barrera (CNIN); 1 female: México, Puebla, Nuevo Vicencio, km 50 Carretera El Seco – Amozoc, 20-V-1995, G. Ortega and E. Barrera (CNIN); 3 females: Mexico, Pachuca, H90, 8000 ft, 6, 9-VII-1937, M. A. Embury (WFBM).

Differential diagnosis. *Cymatodera pueblae* is readily distinguished from similar species and other congeners by its small size, shape, sinuate midelytral fascia (Fig. 2), male terminalia (Figs 18–19), genitalia (Fig. 12), and geographic distribution (Fig. 34). No other species has this combination of characters.

Description. Holotype. Small, rather robust, posterior wings present, brachypterous, TL= 8.67 mm. Color: Head fuscous; pronotum, prosternum, mesosternum, metasternum, legs and elytra brown; abdomen testaceous mesally, becoming brown toward sides; mouthparts pale testaceous. Each elytron bearing a pale testaceous, median fascia that extends from first stria to epipleuron (Fig. 2).

Head: HL= 1.15 mm, HW= 1.88 mm. Measured across eyes conspicuously wider than pronotum; rugose; frons bi-impressed; strongly, coarsely punctate; clothed with short, semirecumbent setae intermixed with long, semierect and erect setae; eyes moderately large, subsinuate, longer than wide, moderately emarginate in front, feebly bulging laterally, separated by approximately 3.5 eye-widths. Antennae slender; loosely composed; extending slightly beyond posterior margin of elytra; antennomeres 2–3 subequal in length; fourth antennomere slightly longer than third antennomere; antennomeres 4–5 subequal in length; antennomeres 6–10 subequal in length, each slightly shorter than fifth antennomere; antennomeres 5–10 weakly serrate; last antennomere flattened apically, as long as tenth antennomere (Fig. 7).

Thorax: PL = 2.35 mm, PW = 1.67 mm. Pronotum elongate; widest at middle; middle slightly broader than anterior margin; sides constricted subapically; somewhat more constricted behind middle; disc flat; very feebly impressed in front of middle; subbasal tumescence pronounced; surface rugose; moderately coarsely punctate; somewhat vested with short, recumbent setae, intermingled with less numerous, long erect setae. Prosternum wider than long, rugulose, puncticulate. Mesosternum coarsely, deeply punctate. Metasternum convex; reduced in length, rugulose, moderately shallowly punctate.



Figures 11–15. Male genitalia of: **11** *Cymatodera bogcioides* **12** *C. pueblae* **13** *C. mitae* **14** *C. lineata* **15** *Bogicia oaxacae*.

Legs: Femora clothed with short, recumbent setae interspersed with few erect and semierect setae; tibiae vested with short and long erect and semierect setae; femorae and tibiae transversely, moderately rugose.

Elytra: EL= 5.17 mm, EW= 2.8 mm. Anterior margin arcuately emarginate; narrower than widest portion of pronotum; humeri very feebly indicated; sides subovoid; widest behind middle; disc convex; apex rounded, broadly dehiscent; surface smooth, clothed with intermixed setae of three sizes; sixth tergite exposed dorsally; sculpturing consisting of regular, rather coarse and deep striae that gradually reduce in size after first third of elytral length, striae not reaching posterior 1/4 of elytral length; interstices about 1.5× the width of punctation at elytral base.

Abdomen: Ventrites 1–5 rugulose, shallowly, moderately punctate; each segment with a pair of large, shallow impressions near sides; clothed with short, recumbent setae interspersed with less numerous, long, semi-erect setae. Fifth visible ventrite convex; sides oblique; posterior margin broadly, very deeply emarginate, emargination extends beyond first third of ventrite length (Fig. 18); sixth visible ventrite subquadrate; rugulose; surface strongly concave, excavated; moderately coarsely punctate; lateral margins subparallel; posterior margin broadly, very deeply emarginate, emargination extends to near base of segment; posterolateral angles arcuate, recurved ventrally. Fifth tergite moderately convex; rugulose; lateral margins subparallel; posterior margin broadly, shallowly, triangularly emarginate (Fig. 19). Sixth tergite subtriangular; surface strongly convex, smooth, shiny, shallowly punctate; lateral margin oblique; posterior margin subtruncate, narrowly, very shallowly, triangularly emarginate. Sixth tergite extending beyond sixth visible ventrite, fully covering it from dorsal view. Aedeagus: 1.4 mm long; ratio of length of parameres to whole tegmen 0.68: 1; tegmen robust, fully covering phallus; parameres robust, pointed at apex, lateral margins moderately oblique, procurved, posterior portion feebly curved ventrally; phallobase broad; phallus with copulatory piece somewhat acuminate distally; phallic plate armed with a row of long, posteriorly pointed denticles along dorsal margin; phallobasic apodeme short, robust, dilated distally; endophallic struts slender throughout their length (Fig. 12).

Females differ from males by having the posterior margin of the fifth visible ventrite longitudinally truncate; the sixth visible ventrite is rather convex, rugose and broader than long, the lateral margins are strongly oblique, giving the appearance of a broadly rounded margin (Fig. 27); posterior margin of fifth tergite broadly, very shallowly, triangularly emarginate; sixth tergite subtriangular, rugulose, surface moderately convex, broader than long, lateral and posterior margins strongly oblique, forming a semicircular perimeter.

Variation. Length of males 7.9–9.65 mm, length of females 8.85–10.2 mm; $n=5$. Length to width ratio of head: males average 0.71, of females 0.83. Length to width ratio of thorax: males average 1.42, females average 1.6. Length to width ratio of elytra: males average 1.82, females average 1.94. One male and one female are darker than the rest of the type series; the mid-elytral fascia of one female is paler and the legs display a paler, yellowish coloration.

Distribution. The type series of this species was collected at different localities in south-central Mexico, a high-altitude region characterized by various ranges surrounded by semiarid plateaus. Two males and two females were collected in the central and south region of the state of Puebla, Mexico; three females were collected in the vicinity of Pachuca, Hidalgo, Mexico; and one female was collected in km 41, highway Texcoco - Calpulalpan in the State of Mexico, a region that borders the central-western portion of the state of Puebla. The vegetation type in all collecting localities is predominantly a low to mid-altitude mixture of *Quercus* - *Juniperus* - *Cupressus* spp. in association with thorny species (Fig. 34).

Etymology. The specific epithet refers to Puebla, the Mexican state where the holotype was collected.

***Cymatodera mitae* Burke, sp. n.**

<http://zoobank.org/D8B43827-4941-42D9-8DF4-860ECA76A259>

http://species-id.net/wiki/Cymatodera_mitae

Figs 3, 8, 13, 20, 21, 28, 32, 33

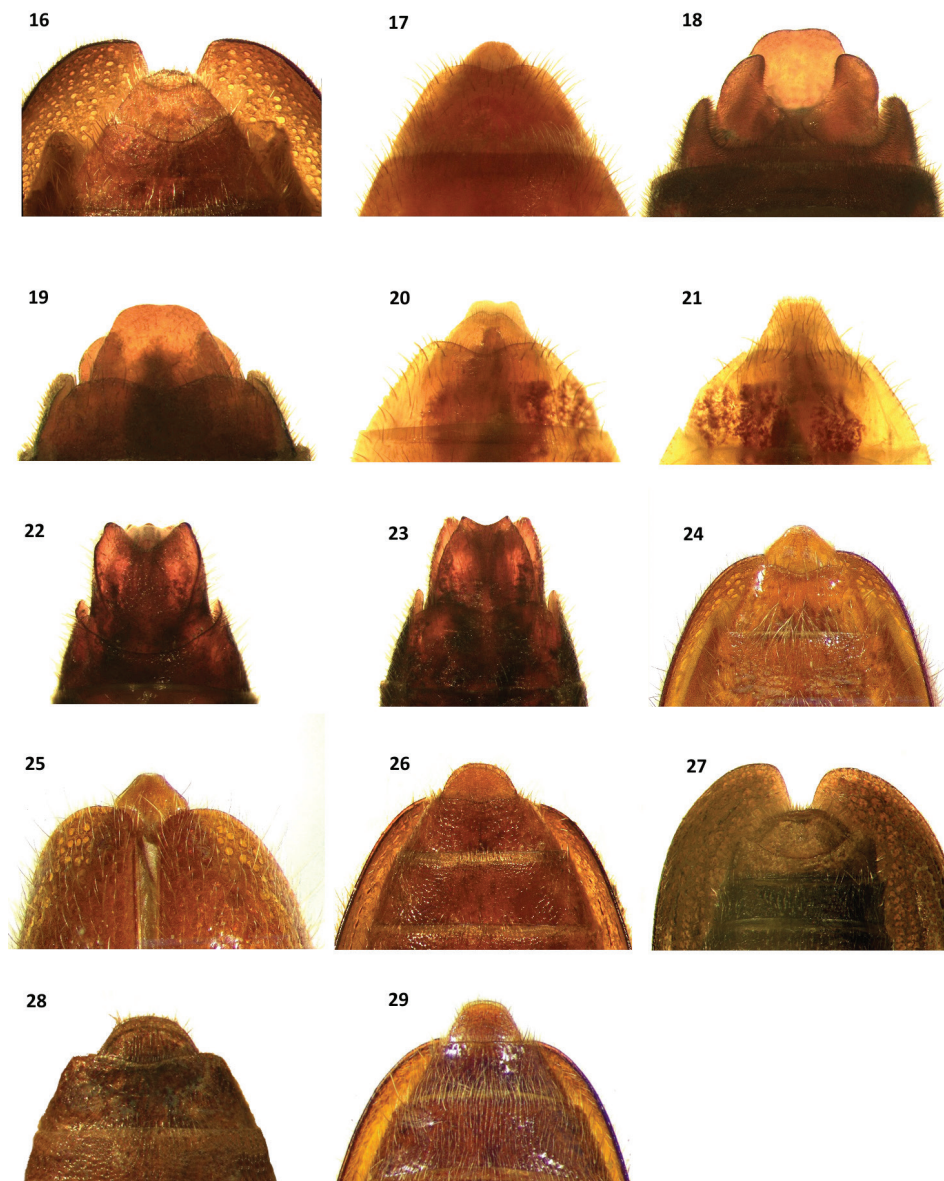
Type material. Holotype: male, Mexico, Nayarit, 2 km NE Punta de Mita, 26-VII-1990, R. L. Westcott, printed red label, holotype deposited in CSCA. **Paratypes:** 2 males and 3 females. 2 females and 1 male: Mexico, Nayarit, 2 km E Punta de Mita, 30-VII to 2-VIII-1993, C. L. Bellamy (JNRC); 1 female: Mexico, Jalisco, 2 km N Cuitzamala, 10-IX-1988, on dead wood, F. T. Hovore (CNCI). 1 male: Mexico, Nayarit, Playa Piedra Blanca, vicinity of Punta de Mita, 22-VII-1993, tropical deciduous forest, mercury vapor and black light, Rifkind, Bellamy and Reifshneider (JNRC).

Differential diagnosis. This species can be distinguished from congeners by its small size (Fig. 3), antennomeres 4–10 gradually becoming serrate distally, and the conspicuously robust and elongate eleventh antennomere (Fig. 8). The fifth and sixth abdominal segments (Figs 20–21) and genitalia (Fig. 13) of the male also serve to separate this species from remaining *Cymatodera* species. Together with *C. bogcioides*, *C. mitae* is part of a group of species characterized by a broad, rather deep carina that extends transversely across the first visible ventrite of males (Figs 30, 32).

Description. Holotype. Small, somewhat robust, posterior wings fully developed, TL= 7.75 mm. Color: head, pronotum, prosternum, mesosternum and metasternum ferruginous-brown, remainder of body uniformly brown. Each elytron with a brown macula located on humeral angle and a pair of irregular, obliquely directed fasciae located on median region of elytral length, the first fascia diffuse, yellowish-testaceous, extending from first stria to epipleuron, the second black, posteriorly adjacent to first fascia, extending from second stria to seventh stria (Fig. 3).

Head: HL= 0.7 mm, HW= 1.35 mm. Measured across eyes wider than pronotum; surface moderately rugose; frons bi-impressed; moderately, coarsely punctate; vested with short, recumbent setae and occasional long, semierect setae behind eyes; eyes rather rounded, moderately large, somewhat longer than wide, feebly emarginate in front, bulging laterally. Antennae not reaching posterior margin of pronotum; first antennomere 0.75× longer than second antennomere, third antennomere about equal in length to first antennomere; fourth antennomere slightly shorter than third antennomere; antennomeres 4–10 subequal in length; antennomeres 2–4 subcylindrical; antennomeres 4–10 gradually becoming serrate toward distal end; last antennomere somewhat robust, cylindrical, about the same length as preceding three antennomeres (Fig. 8).

Thorax: PL= 1.95 mm, PW= 1.25 mm. Pronotum rugose; moderately, finely punctate; less coarsely punctate than head; anterior margin as wide as middle; sides constricted subapically; slightly more constricted behind middle; disc flat, inconspicuously impressed in front of middle; subbasal tumescence moderately produced; surface clothed with moderately long, semierect setae interspersed with long semierect



Figures 16–29. Terminalia of: **16** *Cymatodera bogcioides* (male, ventral view) **17** *C. bogcioides* (male, dorsal view) **18** *C. pueblae* (male, ventral view) **19** *C. pueblae* (male, dorsal view) **20** *C. mitae* (male, ventral view) **21** *C. mitae* (male, dorsal view) **22** *C. lineata* (male, ventral view) **23** *C. lineata* (male, dorsal view) **24** *Bogcia oaxacae* (male, ventral view) **25** *B. oaxacae* (male, dorsal view) **26** *C. bogcioides* (female ventral view) **27** *C. pueblae* (female ventral view) **28** *C. mitae* (female ventral view) **29** *B. oaxacae* (female, ventral view).

and erect setae. Prosternum smooth, shiny, feebly, shallowly punctate. Mesosternum smooth, shiny; moderately, shallowly punctate. Metasternum with surface rugulose, shiny, moderately, shallowly punctulate.

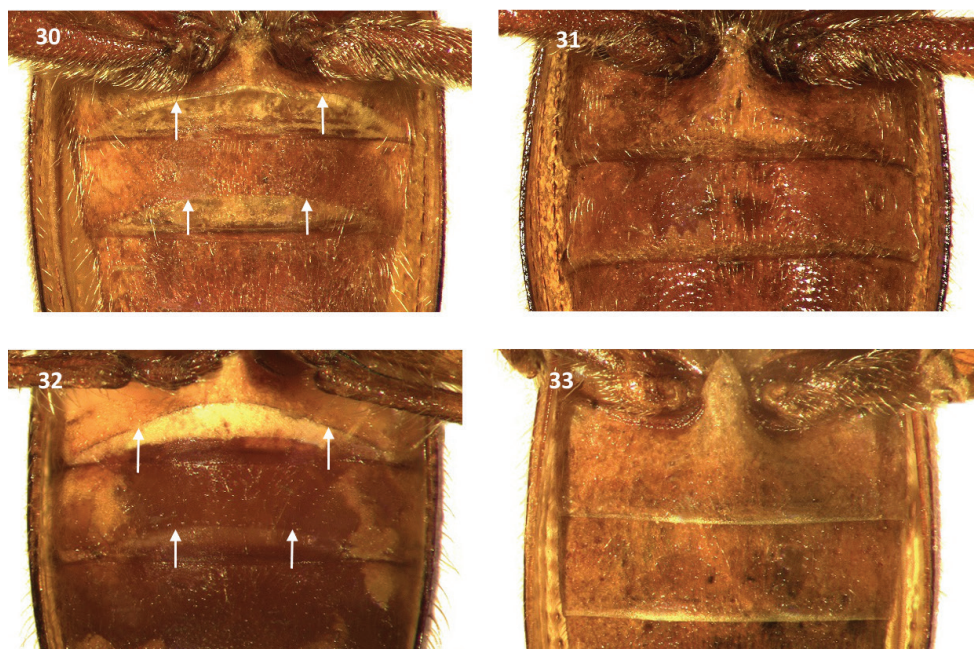
Legs: Moderately vested with semirecumbent and semierect setae of three sizes; femora somewhat puncticulate, rugulose; tibia moderately, shallowly punctate, rugulose; fourth pulvillus medially incised, incision not extending beyond apical third.

Elytra: EL= 5.1 mm, EW= 2.35 mm. Broader than pronotum; humeri indicated, rounded; sides subparallel; widest portion behind middle; disc flattened above; surface shiny, rugulose; apices rounded; somewhat dehiscent; elytral declivity gradual; clothed with short, semierect setae intermixed with long, semierect and erect setae, long setae more abundant on anterior 1/4 of elytral ground; sculpture consisting of coarse punctations arranged in regular striae that gradually become smaller and shallower on posterior 1/4 of elytral ground, punctations not reaching elytral apex; interstices at elytral base about 2× the width of punctuation.

Abdomen: Ventrites 1–5 rugulose; strongly, finely punctate; clothed with short, fine, recumbent setae. First ventrite rather convex; subquadrate, posterior margin conspicuously elevated with a transverse carina that initiates on posterolateral angles, producing a broad, deep, arcuate emargination (Fig. 32). Second visible ventrite convex; subquadrate; posterior margin feebly elevated with a longitudinal carina producing a moderately broad, rather deep, arcuate emargination. Fifth visible ventrite moderately convex; subquadrate; surface shiny, moderately, shallowly, finely punctate; lateral margins oblique; posterolateral angles rounded; posterior margin truncate with a median, narrow, shallow emargination (Fig. 20). Sixth visible ventrite small; broader than long; surface feebly convex, shiny; moderately, finely and shallowly punctate; lateral margins strongly convex, hind margin reduced, shallowly, broadly emarginate. Fifth tergite subquadrate, rugulose; lateral margin subparallel, posterior margin broadly, shallowly emarginate (Fig. 21). Sixth tergite subtriangular, broader than long; surface rugulose; lateral margins strongly oblique. Sixth tergite extending beyond apical margin of sixth visible ventrite; base of sixth visible ventrite extending laterally, slightly farther than sixth tergite. Aedeagus: 0.9 mm long; robust; ratio of length of paramere to whole tegmen 0.39: 1; tegmen partially covering phallus; parameres moderately robust; lateral margins obtuse, pointed distally; phallobase wide; phallic plate armed with a long row of large, sharp denticles along dorsal margin; phallobasic apodeme slender, moderately short; endophallic struts slender throughout their length (Fig. 13).

Females in the type series have the first visible ventrite posteriorly truncate and slightly longer than males, and lack the transverse carina (Fig. 33) present in males (Fig. 32). The second visible ventrite also lacks the moderately elevated carina observed in males. Fifth visible ventrite rugulose; lateral margins rather arcuate, feebly oblique; posterior margin truncate and medially narrowly, very shallowly emarginate; sixth visible ventrite rugulose, feebly convex; semicircular; lateral and posterior margins broadly rounded (Fig. 28); fifth tergite rugulose, subtriangular; lateral margins moderately oblique; posterior margin shallowly, broadly, triangularly emarginate. Sixth tergite subtriangular; rugulose; broader than long; surface inconspicuously convex; lateral margins rather arcuate, strongly oblique; posterior margin arcuate, rendering a rather continuous and semicircular posterolateral margin. Sixth tergite extending beyond sixth visible ventrite.

Variation. Length of males 6.9–8.1 mm, length of females 7.15–8.7 mm; n= 6. Length to width ratio of head: males average 0.59, females average 0.66. Length to



Figures 30–33. First and second visible ventrites of: **30** *Cymatodera bogcioides* (male) **31** *C. bogcioides* (female) **32** *C. mitae* (male) **33** *C. mitae* (female). Arrows indicate transverse carinae.

width ratio of thorax: males average 1.6, females average 1.62. Length to width ratio of elytra: males average 2.18, females average 2.21. Two males and one female show a slightly darker integument on the elytral disc; also, these individuals display the humeral maculae completely black, rather than dark brown, as seen in the holotype. One male in the type series displays a feebly paler coloration on the elytral disc. The black fascia is variably marked among individuals, ranging from strongly marked to rather diffuse.

Distribution. The type series was collected primarily in Punta Mita, at the southwestern tip of the state of Nayarit, Mexico. One female specimen was collected in the Cuitzmala region of Jalisco, about 50 km southeast of Punta Mita, Nayarit (Fig. 34).

Etymology. The specific epithet refers to Punta Mita, Nayarit, Mexico, the locality where the holotype was collected.

***Cymatodera lineata* Burke, sp. n.**

<http://zoobank.org/25C70887-9B54-4386-BE3E-83DC809D5458>

http://species-id.net/wiki/Cymatodera_lineata

Figs 4, 9, 14, 22, 23

Type material. Holotype: male, México, Michoacán, km 23 carretera Morelia - Pátzcuaro, 2000 m, 26-V-1988, A. Cadena and L. Cervantes, printed red label, holotype

deposited in CNCI. **Paratype:** 1 female: Mexico, Durango, 26 miles W Durango, 13-VII-1974, beating oak, collector unknown (WFBM).

Differential diagnosis. The distinctive dark, longitudinal fasciae on the elytral ground, unique among all *Cymatodera* species, serve to separate *C. lineata* from those species with a similar metathorax and anterior elytral margin.

Description. Holotype. Moderately long, slender, posterior wings absent, TL=9.9 mm. Color: Head, except gular region and pronotum, fuscous; antennae, mouthparts, gular region, prosternum, mesosternum and abdomen, except anterior portion of first visible ventrite, testaceous; legs, metasternum and anterior portion of first visible ventrite brown. Each elytron adorned with five longitudinal, moderately regular, fuscous fasciae; fasciae becoming paler and narrower toward epipleuron; fasciae 2–4 not reaching elytral apex; first and fifth fasciae interconnected at posterior portion of elytra, reaching apex (Fig. 4).

Head: HL= 1.3 mm, HW=2.25 mm, length to width ratio of holotype 0.58. Measured across eyes conspicuously wider than pronotum; surface rugose; moderately, coarsely punctate; clothed with a set of intermixed moderately long, recumbent and semirecumbent setae; frons inconspicuously bi-impressed; eyes small, subsinuate, taller than wide, feebly bulging laterally, separated by approximately 3.2 eye widths. Antennae extending to base of elytra; third antennomere slightly longer than second antennomere; antennomeres 3–5 subequal in length; sixth antennomere slightly shorter than fifth antennomere; antennomeres 6–10 subequal in length; antennomeres 2–4 subcylindrical; antennomeres 5–10 very feebly serrate; last antennomere subacuminate, about the same length as tenth antennomere (Fig. 9).

Thorax: PL= 2.55 mm, PW=1.8 mm; length to width ratio of holotype 1.42 mm. Pronotum somewhat elongate; widest at middle, middle slightly wider than anterior margin; sides constricted subapically, more strongly constricted behind middle; disc feebly convex; moderately impressed in front of middle; subbasal tumescences pronounced; surface moderately clothed with short, semirecumbent setae interspersed with erect setae of three lengths; surface feebly rugose, less rugose than head; moderately, shallowly punctate. Prosternum rugulose; surface feebly concave; weakly, shallowly punctate. Mesosternum concave; moderately, coarsely punctate, scarcely clothed with long, erect setae; metasternum conspicuously wider than long; strongly concave; rugulose; moderately, shallowly punctate.

Legs: Femora and tibiae profusely clothed with short, semirecumbent setae interspersed with long, semierect and erect setae; femora and tibiae transversally, moderately rugose; fourth protarsomere with pulvillus medially incised, incision not extending beyond middle.

Elytra: EL= 6.05 mm, EW= 2.8 mm; length to width ratio of holotype 2.16. Base narrower than pronotum; humeri very feebly indicated; sides subparallel; widest at posterior 1/3; disc feebly convex; surface rugose; apices rounded; strongly dehiscent; clothed with erect setae of three sizes; sculpture consisting of coarse punctations arranged in irregular striae that gradually become smaller, shallower and less numerous before apex; interstices at elytral base about 1.5× the width of punctuation.

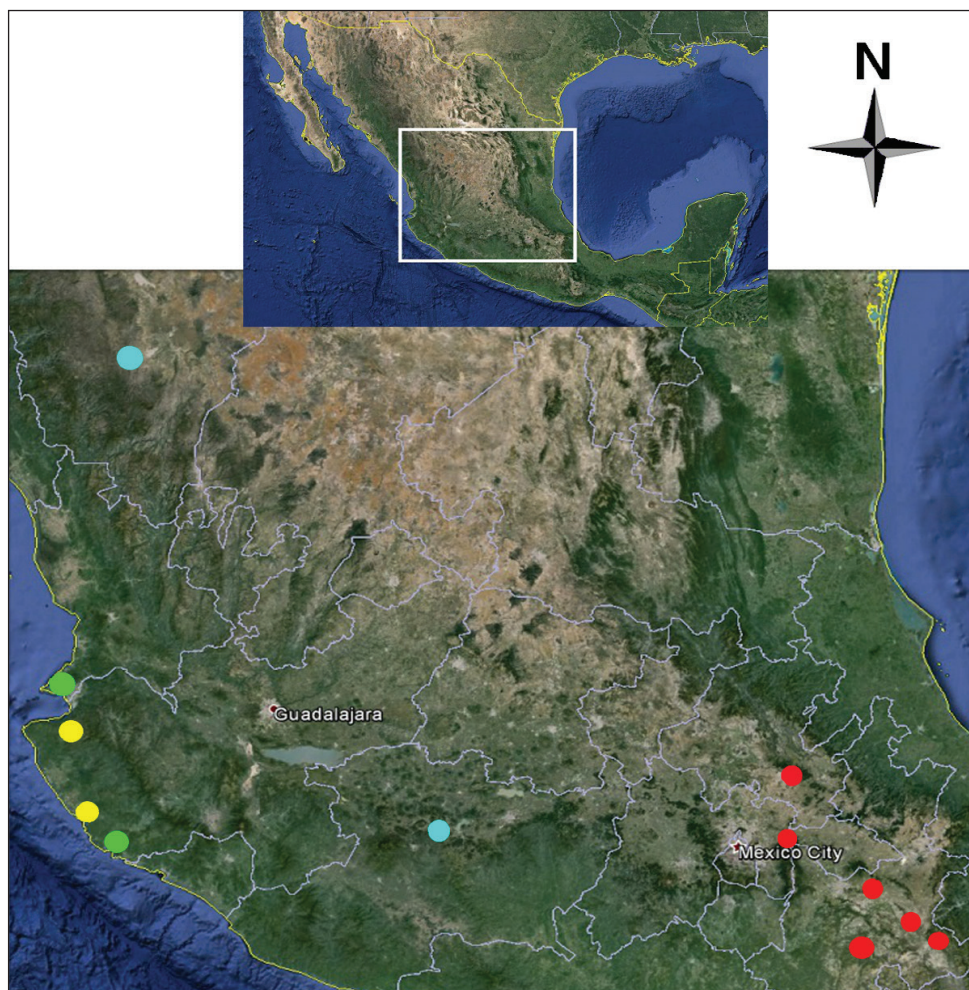


Figure 34. Map of central Mexico showing geographic position of collecting localities for: *Cymatodera bogcioides* (yellow circles); *C. pueblae* (red circles); *C. mitae* (green circles); and *C. lineata* (light blue circles).

Abdomen: Ventrites 1–5 rugulose, subquadrate, moderately, shallowly punctate, vested with short, fine, pale, recumbent setae; posterior margin of third and fourth visible ventrite broadly, deeply emarginate. Fifth visible ventrite subquadrate; surface convex; moderately, coarsely punctate; lateral margins subparallel; posterior margin broadly, deeply emarginate; emargination reaching median region; posterolateral angles pointed (Fig. 22). Sixth visible ventrite subquadrate, longer than broad; surface rugose; moderately, coarsely punctate; with a pair of longitudinal carinae that extend from about the base to near posterolateral angles; lateral margins subparallel, posterior margin broadly, deeply triangularly emarginate, emargination extending from near posterolateral angles to basal fourth; posterolateral angles rounded, recurved ventrally. Fifth tergite rugulose, lateral margins subparallel; posterior margin truncate, with a narrow,

shallow, triangular emargination on median region (Fig. 23). Sixth tergite subquadrate, broader than long; surface rugulose; lateral margins feebly arcuate, oblique; posterior margin, broadly, shallowly emarginate; posterolateral angles pointed, recurved dorsally. Sixth tergite extending slightly beyond apical margin of sixth visible ventrite, fully covering the latter from dorsal view. Aedeagus: 2.1 mm long; ratio of length of parameres to whole tegmen 0.65:1; tegmen fully covering phallus; parameres robust at base, then gradually becoming slender toward distal end, pointed at apex, lateral margins oblique; phallobase broad; phallus with copulatory piece rounded distally, posteriorly dilated; phallic plate armed with a row of moderately long denticles along dorsal margin; phallobasic apodeme short, robust, dilated distally; endophallic struts slender throughout their length (Fig. 14).

The only female in the type series has the fifth visible ventrite rugulose; surface convex; lateral margins strongly oblique, rather arcuate; posterior margin widely, deeply emarginate. Sixth visible ventrite rugulose; coarsely punctate; moderately convex; lateral margins feebly arcuate, moderately oblique; posterior margin truncate. Fifth tergite rugulose; surface feebly convex; lateral margins oblique, moderately arcuate; posterior margin broadly, shallowly emarginate. Sixth tergite subtriangular; rugulose; coarsely punctate; lateral margins strongly oblique, feeble arcuate; posterior margin narrowly truncate. Sixth tergite extends very slightly beyond sixth visible ventrite.

Variation. The female has a length of 8.2 mm. Length to width ratio of head: 0.52. Length to width ratio of thorax: 1.51. Length to width ratio of elytra: 2.11. The female shows a moderately brownish coloration, somewhat lighter than the male, and the antennomeres 5–10 are filiform, rather than feebly serrate, as observed in the male.

Distribution. The holotype was collected in the state of Michoacán, at the central-western portion of Mexico, on km 23 on the Morelia-Pátzcuaro highway, a region that has suffered extensive logging and was originally covered by a high to mid altitude *Pinus* - *Quercus* association; the female was collected in the state of Durango, 26 km west of the city of Durango, Mexico (Fig. 34).

Etymology. The specific epithet comes from the Latin *linea* (= line) and refers to the longitudinal fasciae on the elytral ground of this species.

Comments. Although it is not usually desirable to describe a new species based on two specimens, this species is strikingly different from all other known *Cymatodera* species. In addition, the urgent need for identifying and cataloging this diverse group of beetles justifies this description, particularly if such species inhabit poorly known or threatened environments (Rifkind 2012).

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Review of genus *Pseudorthocladius* Goetghebuer, 1943 (Diptera, Chironomidae) from China

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Abstract

The genus *Pseudorthocladius* Goetghebuer, 1943 from China, including 12 species, is reviewed. Five new species, *P. (P.) binarius* sp. n., *P. (P.) cylindratus* sp. n., *P. (P.) digitus* sp. n., *P. (P.) ovatus* sp. n. and *P. (P.) paucus* sp. n. are described and illustrated as adult males. *P. (P.) cristagus* Stur & Sæther, 2004, *P. (P.) jintutridecima* (Sasa, 1996), *P. (P.) macrovirgatus* Sæther & Sublette, 1983, *P. (P.) morsei* Sæther & Sublette, 1983, *P. (P.) uniserratus* Sæther & Sublette, 1983, *P. (L.) wingoi* Sæther & Sublette, 1983 are newly recorded in Oriental Region. A key to the males of *Pseudorthocladius* in China is presented.

Keywords

Chironomidae, *Pseudorthocladius*, new species, new record, key, Oriental, China

Introduction

The genus *Pseudorthocladius* Goetghebuer, 1943 contains two subgenera, *Pseudorthocladius* Goetghebuer and *Lordella* Sæther & Sublette (Sæther and Sublette 1983). The two subgenera are different in the shape of inferior vosella and microtrichia

on the gonostylus. The presence of well developed pulvilli [except *P. (P.) oyabecrassus* Sasa, Kawai & Ueno, 1988], an apical antennal seta, lack of pseudospurs, acrostichals long and beginning near the anteprenorum, curved Cu_1 and an anal point with strong setae will separate the genus from other orthoclad genera.

The subgenus *Lordella* shows some similarities and possible synapomorphies with *Doithrix*, such as the basally widened gonostylus and hook-shaped inferior volsella. However, the long anal point and setae on the point indicating an intermediate position between typical *Pseudorthocladius* s. str. and *Doithrix*. So the status of subgenus *Lordella* needs to be further discussed.

The immatures of *Pseudorthocladius* are found in a wide variety of damp habitats including mosses, hygropetric regions, seeps and floodplains along stream banks (Strenzke 1950, Sæther and Sublette 1983, Cranston et al. 1989)

According to Ashe and O'Connor 2012, this genus presently comprises 52 valid species in the world with 34 species in the Palearctic Region, 17 in the Nearctic Region, 5 in the Oriental Region, 2 in the Afrotropical Region. Eastern Palearctic Asia appears to be a rich area of diversity in the genus: 24 species from Japan (Yamamoto 2004), 7 species from the Far East of Russia (Makarchenko and Makarchenko 2012), only 1 species from China (Wang 2000).

In this paper, the *Pseudorthocladius* based on material from China is reviewed. Five new species are described, six species are newly recorded in China, and key to the Chinese species of *Pseudorthocladius* is presented.

Materials and methods

The morphological nomenclature follows Sæther (1980). The materials examined are mounted on slides, following the procedure outlined by Sæther (1969). Measurements are given as ranges followed by the mean, when four or more specimens are measured, followed by the number of specimens measured (n) in parentheses. All specimens examined during this study are deposited in the College of Life Sciences, Nankai University, China.

Taxonomy

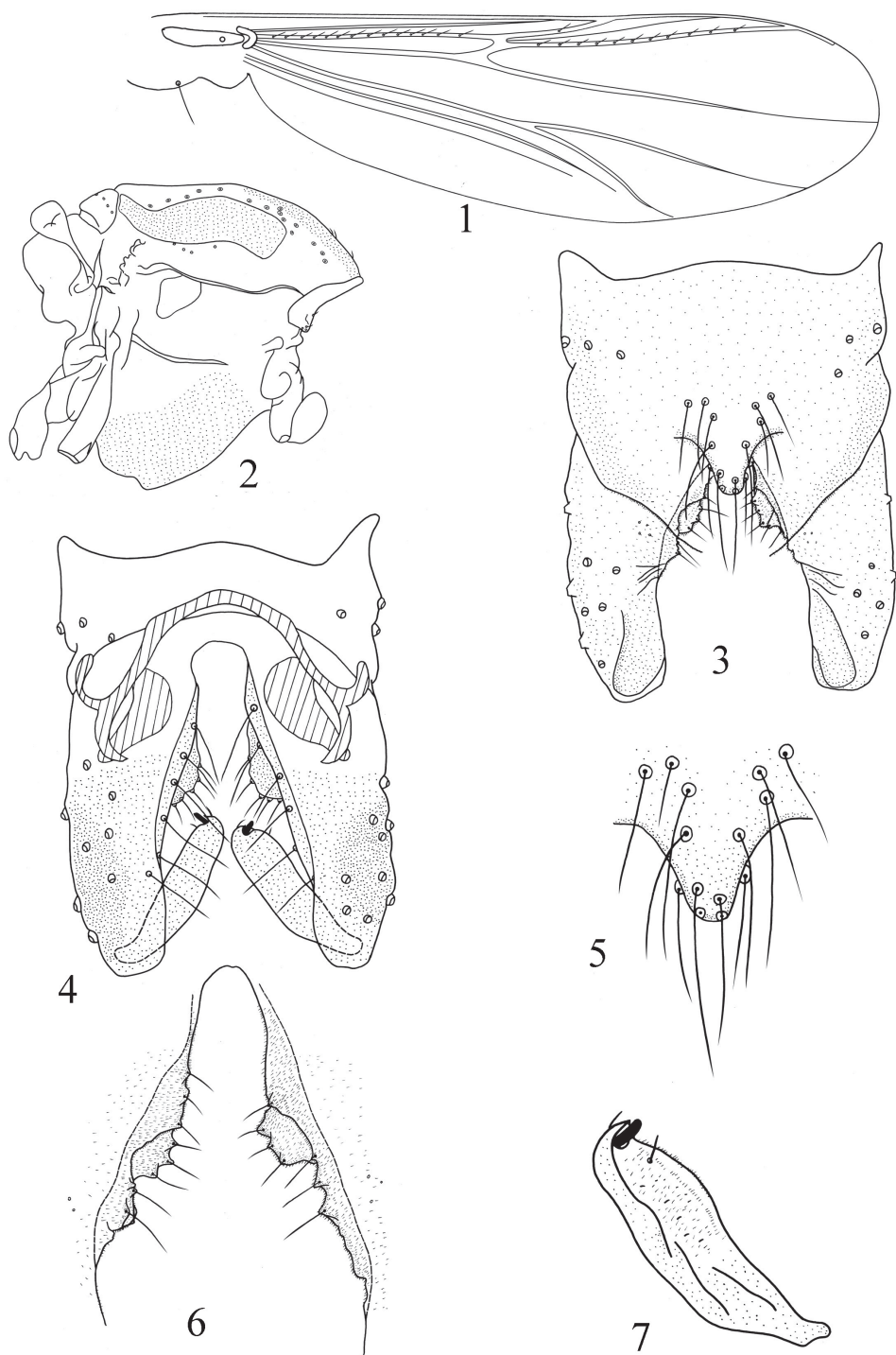
Pseudorthocladius (Pseudorthocladius) binarius sp. n.

<http://zoobank.org/D5AC53EC-771A-4D91-ADF2-B3EB97CDF0FD>

http://species-id.net/wiki/Pseudorthocladius_binarius

Figures 1–7

Diagnosis. The male imago can be distinguished from the known species of the genus by the following combination of characters: low AR (0.29); squama with few setae; anal lobe reduced; inferior volsella has two sub-lobes; virga absent.



Figures 1–7. *Pseudorthocladius* (*P.*) *binarius* sp. n., male. **1** wing **2** thorax **3** hypopygium (dorsal view) **4** hypopygium (ventral view) **5** anal point **6** inferior volsella **7** gonostylus.

Description. Adult male (n = 4). Total length 1.50–1.80, 1.63 mm. Wing length 0.81–0.97, 0.89 mm. Total length/wing length 1.83–1.86, 1.84. Wing length/length of profemur 2.26–2.43 (3).

Coloration. Head, abdomen, legs brown; thorax with yellow ground with brown postnotum and preepisternum.

Head. Antenna with 13 flagellomeres. Terminal flagellomere length 95–108, 105 μm . AR 0.28–0.33, 0.29. Temporal setae 8 (2), including 2 (2) inner verticals, 3–4 (3) outer verticals, and 2 (2) postorbitals. Clypeus with 6–10, 8 setae. Tentorium 86–96, 92 μm long, 14–19, 15 μm wide. Palpomere lengths (in μm): 19–24, 22; 26–29, 28; 55–62, 59; 84–91, 86; 98–120, 110. L: 5th/3rd 1.77–2.10, 1.86.

Wing (Figure 1). VR 1.25–1.29 (3). Anal lobe reduced. Brachiolum with 1 seta; R with 9–15, 13 setae; R₁ with 1–4, 2 setae; R₄₊₅ 9–11, 10 setae; M with 0–1, 1 seta. Squama with 1–2, 1 seta. Costal extension 70 μm long. Cu₁ slightly curved.

Thorax (Figure 2). Anteprepronotum with 3–6, 5 lateral setae, dorsocentrals 13–15, 13, acrostichals 3–7, 5, prealars 4–6, 5. Scutellum with 6–8, 7 setae.

Legs. Pulvilli present. Spur of fore tibia 29 (3) μm long, spurs of mid tibia 22–24, 23 μm and 16–19, 18 μm long; hind tibia with a long spur 40–43, 42 μm long, a short spur 14–17, 16 μm long and comb composed of 10–12, 11 spines. Width at apex of fore tibia 24–28, 26 μm , of mid tibia 20–26, 24 μm , of hind tibia 31–36, 33 μm . Lengths (in μm) and proportions of legs as in Table 1.

Hypopygium (Figures 3–7). Laterosternite IX with 4–6, 5 setae. Anal point (Figure 5) subtriangular with rounded apex, 24–26, 25 μm long, with 13–15, 14 strong setae. Phallapodeme 22–24, 24 μm long. Transverse sternapodeme 44–50, 48 μm long. Virga absent. Gonocoxite 110–122, 118 μm long. Inferior volsella (Figure 6) with two sub-lobes, the dorsal lobe with concave inner margin and 4–5, 5 marginal setae, the ventral lobe semi-rounded with 3–4, 3 marginal setae. Gonostylus (Figure 7) 60–67, 64 μm long, narrowed at base. Megaseta 9–10, 10 μm long. HR 1.82–1.92, 1.85. HV 2.43–2.48, 2.45.

Table 1. Lengths (in μm) and proportions of legs of *Pseudorthocladius* (*P.*) *binarius* sp. n.

	P ₁	P ₂	P ₃
fe	350–400 (3)	350–400, 375	360–400, 380
ti	340–420 (3)	350–430, 373	410–500, 435
ta ₁	250–300 (2)	125–150, 131	220–260, 240
ta ₂	170–210 (2)	72–96, 78	115–130, 124
ta ₃	120–140 (2)	60–72, 63	105–126, 115
ta ₄	72–84 (2)	36–48, 42	48–60, 53
ta ₅	51–67 (2)	48–50, 49	48–60, 54
LR	0.71 (2)	0.33–0.37, 0.35	0.52–0.56, 0.55
BV	2.22–2.30, 2.29	3.63–3.98, 3.71	2.98–3.13, 3.02
SV	2.73–2.80, 2.76	5.53–5.72, 5.62	3.32–3.50, 3.41
BR	2.50–2.60, 2.56	3.14–3.67, 3.45	3.75–4.38, 4.03

Female, pupa and larva unknown.

Type materials. Holotype: ♂ (BDN No.20200), China, Fujian, Quanzhou City, Dehua County, Daiyun Mountain, 25°40'N, 118°11'E, 13.ix.2002, Zheng Liu, sweep net. Paratypes: 3 ♂♂, as holotype.

Etymology. The specific name is from Latin, *binarius*, meaning “of two”, referring to the inferior volsella has two sub-lobes.

Remarks. The new species resembles *P. (P.) tusimoquereus* Sasa & Suzuki (1999) in the structure of hypopygium, but can be separated from the latter on the following points: (1) *P. (P.) binarius* sp. n. has small body size (1.63 mm) and low AR (0.29); (2) wing anal lobe reduced and squama with few setae; (3) inferior volsella with two sub-lobes; (4) virga absent.

Distribution. The new species is collected in a subtropical mountain area in Fujian Province (Oriental China).

Pseudorthocladius (Pseudorthocladius) cristagus Stur & Sæther, 2004

http://species-id.net/wiki/Pseudorthocladius_cristagus

Pseudorthocladius (Pseudorthocladius) cristagus Stur & Sæther, 2004: 79; Ashe and O'Connor 2012: 531.

Diagnosis. The male imago is separable from the other species of the genus *Pseudorthocladius* by having hairy wings, strong crista dorsalis and outer heel of the gonotylus.

Specimens examined. China, Zhejiang: 1 ♂ (BDN No.K5B50), Taizhou City, Tiantai County, Huading Mountain, 29°15'45"N, 121°06'36"E, 13.iv.2011, Xiaolong Lin, sweep net.

Remarks. Stur and Sæther (2004) erected a hairy-winged species *P. (P.) cristagus* based on the specimen from Luxemburg. The species can be separated from close species *P. (P.) pilosipennis* by having a gonostylus with a prominent crista dorsalis and an outer heel. The Chinese specimen mainly agrees with the original description of Stur and Sæther (2004). Some measured differences between the specimens from China and Luxemburg are shown in Table 2.

Distribution. Zhejiang Province (Oriental China); Luxemburg.

Table 2. Differences between the specimens from China and Luxemburg.

	Chinese specimen	Luxemburg specimens
TL	2.48 mm	3.35–3.41 mm
WL	1.63 mm	1.89–2.02 mm
AR	1.05	1.08–1.14
LR ₁	0.62	0.75–0.76

***Pseudorthocladius (Pseudorthocladius) curtistylus* (Goetghebuer, 1921)**

http://species-id.net/wiki/Pseudorthocladius_curtistylus

Hydrobaenus (Psectrocladius) curtistylus Goetghebuer, 1921: 101.

Spaniotoma (Orthocladus) curtistylus (Goetghebuer); Edwards 1929: 350.

Orthocladus (Pseudorthocladus) curtistylus (Goetghebuer); Goetghebuer 1932: 93, 1940–50: 73.

Spaniotoma curtistylus (Goetghebuer); Edwards 1932: 141.

Hydrobaenus (Pseudokiefferiella) curtistylus (Goetghebuer); Laurence 1951: 165.

Pseudorthocladus curtistylus (Goetghebuer); Thienemann and Kruger 1939: 25; Thienemann 1944: 569, 616; Coe 1950: 160; Strenzke 1950: 230; Brundin 1956: 137; Lehmann 1971: 459; Pinder 1978: 94.

Pseudorthocladus (Pseudorthocladus) curtistylus (Goetghebuer): Sæther and Sublette 1983: 69, fig. 37; Wang 2000: 639; Ashe and O'Connor 2012: 532; Makarchenko and Makarchenko 2012: 76–77.

Diagnosis. AR 0.45–0.70; dorsocentrals 15–18; R with 9–13 setae, R_1 with 2–3 setae, R_{4+5} with 0–14 setae; squama with 3–4 setae; virga present. Type I with low and extending crista dorsalis, type II with crista dorsalis absent, type III with round and protruding crista dorsalis.

Specimens examined. China, Zhejiang: 3 ♂♂, Wenzhou City, Taishun County, 27°33'N, 119°39'E, 1.viii.2005, Xin Qi, light trap; Tianmu Mountain, 30°19'N, 119°26'E, 23.vi.1998, Bingchun Ji, sweep net. Fujian: 10 ♂♂, Wuyi City, Wuyi Mountain, 27°45'N, 118°03'E, 30.iv.1993, Xinhua Wang, sweep net. Guangdong: 5 ♂♂, Fengkai County, 23°24'N, 111°30'E, 20.iv.1988, Xinhua Wang, sweep net. Yunnan: 2 ♂♂, Dali Bai Autonomous Prefecture, Cang Mountain, Qingbi River, 25°36'N, 100°15'E, 23.v.1996, Yuzhou Du, light trap. Hunan: 2 ♂♂, Zhuzhou City, Yanling County, 26°27'N, 113°42'E, 16.vii.2004, Chuncai Yan, sweep net.

Remarks. The Chinese specimens agree with the description of *P. (P.) curtistylus* type II and type III. According to Sæther and Sublette (1983), type II without crista dorsalis, while type III with rounded and protruding crista dorsalis.

Distribution. The species is widely distributed in Holarctic region.

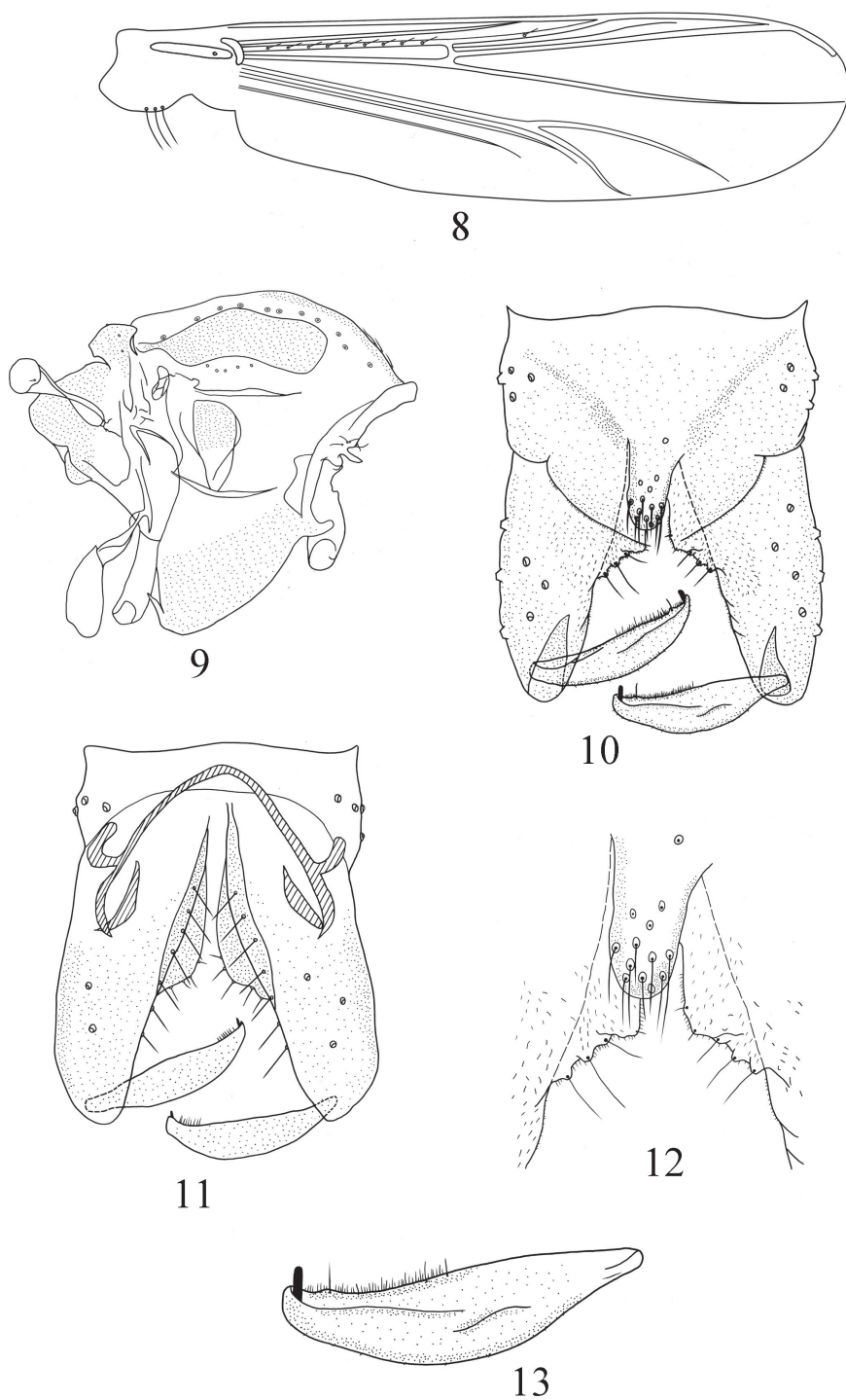
***Pseudorthocladus (Pseudorthocladus) cylindratus* sp. n.**

<http://zoobank.org/399C86DD-F23B-4C2B-9E9F-E8711959DCA2>

http://species-id.net/wiki/Pseudorthocladus_cylindratus

Figures 8–13

Diagnosis. The male imago can be distinguished from the known species of the genus by the following combination of characters: cylindrical anal point; well-developed triangular inferior volsella; low AR (0.66) and high VR (1.37).



Figures 8–13. *Pseudorthocladius* (*P.*) *cylindratus* sp. n., male. **8** wing **9** thorax **10** hypopygium (dorsal view) **11** hypopygium (ventral view) **12** anal point and inferior volsella **13** gonostylus.

Description. Adult male (n = 6). Total length 1.68–1.97, 1.87 mm. Wing length 1.04–1.19, 1.15 mm. Total length/wing length 1.53–1.75, 1.63. Wing length/length of profemur 2.64–2.88, 2.71.

Coloration. Head, abdomen, legs light brown; thorax with light brown ground with brownish black postnotum and preepisternum.

Head. Antenna with 13 flagellomeres. Terminal flagellomere length 235–264, 254 μm . AR 0.65–0.67, 0.66. Temporal setae 8–10, 9, including 3–6, 4 inner verticals, 4–5, 5 outer verticals, and 0–2, 1 postorbital. Clypeus with 8–11, 10 setae. Tentorium 96–113, 103 μm long, 18–21, 19 μm wide. Palpomere lengths (in μm): 22–26, 24; 24–28, 26; 60–72, 65; 84–91, 86; 113–137, 130. L: 5th/3rd 1.87–2.28, 2.00.

Wing (Figure 8). VR 1.33–1.43, 1.37. Anal lobe obtuse. Brachiolium with 1 seta; R with 5–13, 9 setae; R₁ with 1–4, 2 setae; other veins bare. Squama with 1–3, 2 setae. Costal extension 80–84, 81 μm long. Cu₁ slightly curved.

Thorax (Figure 9). Antepronotum with 4–6, 5 lateral setae, dorsocentrals 9–13, 11, acrostichals 3–7, 5, prealars 3–5, 4. Scutellum with 4–5, 5 setae.

Legs. Pulvilli present. Spur of fore tibia 29–41, 34 μm long, spurs of mid tibia 19–29, 22 μm and 19 μm long; hind tibia with a long spur 36–41, 38 μm long, a short spur 24–31, 27 μm long and comb composed of 10–12, 11 spines. Width at apex of fore tibia 34–46, 37 μm , of mid tibia 29–31, 30 μm , of hind tibia 31–36, 33 μm . Lengths (in μm) and proportions of legs as in Table 3.

Hypopygium (Figures 10–13). Laterosternite IX with 4–6, 5 setae. Anal point (Figure 12) cylindrical and 45–49, 48 μm long and with 10–13, 11 stout setae, 23–28, 25 μm long. Phallapodeme 31–36, 34 μm long. Transverse sternapodeme 65–67, 66 μm long and convex in the middle. Virga absent. Gonocoxite 117–137, 123 μm long, with 7 setae along inner margin. Inferior volsella (Figure 12) developed and triangular with 3–4, 3 strong marginal setae. Gonostylus (Figure 13) 65–72, 67 μm long, narrowed at base and distal end, widen in the middle. Megaseta 8–10, 9 μm long. HR 1.83–1.90, 1.85. HV 2.74–3.14, 2.78.

Female, pupa and larva unknown.

Table 3. Lengths (in μm) and proportions of legs of *Pseudorthocladius* (*P.*) *cylindratus* sp. n.

	P ₁	P ₂	P ₃
fe	400–450, 423	440–500, 466	430–490, 456
ti	340–380, 360	440–510, 477	520–570, 530
ta ₁	420–460, 437	200–220, 210	310–340, 323
ta ₂	264–280, 271	150–175, 163	156–180, 171
ta ₃	180–190, 183	142–178, 152	140–144, 142
ta ₄	98–101, 100	52–72, 68	67–74, 72
ta ₅	67–72, 69	48–55, 51	45–55, 52
LR	1.11–1.23, 1.19	0.46–0.59, 0.50	0.60–0.62, 0.61
BV	1.64–1.90, 1.86	2.86–3.80, 2.89	2.92–3.04, 2.95
SV	1.74–1.80, 1.76	4.03–4.45, 4.28	3.00–3.05, 3.02
BR	1.83–2.00, 1.92	2.86–2.92, 2.88	3.00–3.57, 3.26

Table 4. Main differences between *P. (P.) cylindratus* sp. n. and *P. (P.) amplicaudus* Sæther & Sublette (1983).

Characters	<i>P. (P.) cylindratus</i> sp. n.	<i>P. (P.) amplicaudus</i> Sæther & Sublette
Anal point	45–49 µm long and cylindrical	41 µm long and widen at base
AR	0.65–0.67	1.26
VR	1.33–1.43	1.14
LR ₁	1.11–1.23	0.66

Type materials. Holotype: ♂ (BDN No.26348), China: Hunan Province, Chenzhou City, Yizhang County, Mang Mountain, 25°24'N, 113°18'E, 22.vii.2004, Chuncai Yan, light trap. Paratypes (5 ♂♂): 4 ♂♂, as holotype; 1 ♂, Hainan Province, Changjiang County, Bawang Mountain, 19°15'36"N, 109°03'18"E, 10.v.1988, Xinhua Wang, sweep net.

Etymology. The specific name is from Latin, *cylindratus*, meaning “in the form of a cylinder”, referring to the cylindrical anal point, which is unique in the genus.

Remarks. The new species resembles *P. (P.) amplicaudus* Sæther & Sublette, 1983 in the structure of hypopygium, but the new species can be separated from latter on the basis of main characters in Table 4.

Distribution. The new species is known from Hunan, Hainan Province in Oriental China.

***Pseudorthocladius (Pseudorthocladius) digitus* sp. n.**

<http://zoobank.org/F4701FCB-7F55-481D-8F07-0C64CF7C65BC>

http://species-id.net/wiki/Pseudorthocladius_digitus

Figures 14–18

Diagnosis. The male imago can be distinguished from the known species of the genus by the following combination of characters: anal point rounded and reaching beyond the caudal margin of Tergite IX; inferior volsella finger-shaped; squama bare; anal lobe reduced.

Description. Adult male (n = 1). Total length 2.43 mm. Wing length 1.55 mm. Total length/wing length 1.57. Wing length/length of profemur 2.54.

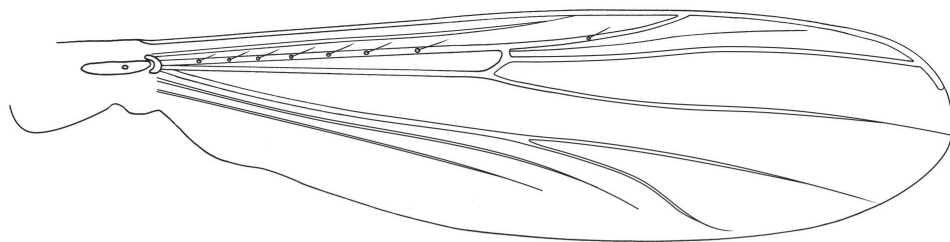
Coloration. Head, abdomen, legs brown; thorax with yellow ground with brown postnotum and preepisternum.

Head. Antenna with 13 flagellomeres. Terminal flagellomere length 300 µm. AR 0.74. Temporal setae 7, including 4 inner verticals, 3 outer verticals. Clypeus with 2 setae. Tentorium 110 µm long, 24 µm wide. Palpomere lengths (in µm): 29, 31, 60, 108, –.

Wing (Figure 14). Anal lobe reduced. Brachiolum with 1 seta; R with 7 setae; R₁ with 1 seta; other veins bare. Squama bare. Costa extension 41 µm long. Cu₁ slightly curved.

Thorax (Figure 15). Anteprepronotum with 5 lateral setae, dorsocentrals 7, acrostichals 2, prealars 5. Scutellum with 9 setae.

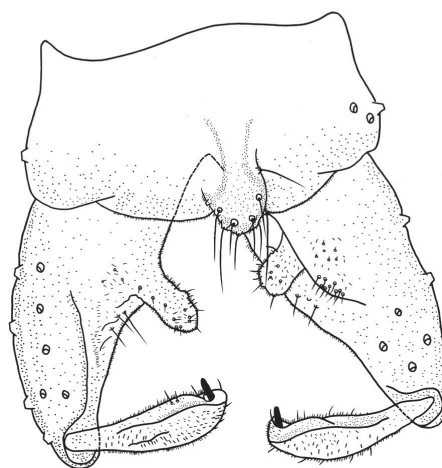
Legs. Pulvilli present. Spur of fore tibia 50 µm long, spurs of mid tibia both 29 µm long; hind tibia with a long spur 60 µm long, a short spur 29 µm long and comb



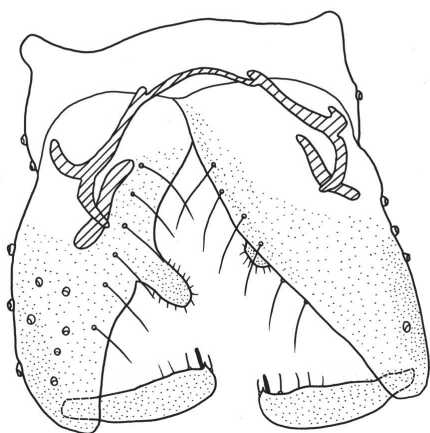
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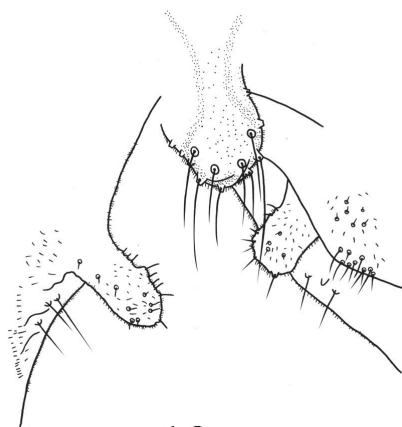
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17



18

Figures 14–18. *Pseudorthocladius* (*P.*) *digitus* sp. n., male. **14** wing **15** thorax **16** hypopygium (dorsal view) **17** hypopygium (ventral view) **18** anal point and inferior volsella.

Table 5. Lengths (in μm) and proportions of legs of *Pseudorthocladius* (*P.*) *digitus* sp. n.

	P₁	P₂	P₃
fe	610	660	700
ti	650	660	800
ta ₁	410	264	450
ta ₂	250	146	240
ta ₃	156	101	180
ta ₄	96	67	74
ta ₅	72	60	72
LR	0.63	0.25	0.56
BV	2.91	4.23	3.44
SV	3.07	5.00	3.33
BR	2.63	1.36	2.78

composed of 12 spines. Width at apex of fore tibia 43 μm , of mid tibia 36 μm , of hind tibia 45 μm . Lengths (in μm) and proportions of legs as in Table 5.

Hypopygium (Figures 16–18). Laterosternite IX with 3 setae. Anal point (Figure 18) rounded and reaching beyond caudal margin of Tergite IX, maximum width 22 μm , with 10 long marginal setae. Phallapodeme 48 μm long. Transverse sternapodeme 50 μm long with small oral projection. Virga absent. Gonocoxite 178 μm long with 6 strong setae along inner margin. Inferior volsella (Figure 18) finger-shaped, parallel-sided and rounded in the apex, bearing some weak setae along the margin and covered by microtrichia. Gonostylus 84 μm long, narrow at base, widen to the distal, with 3–4 setae along inner margin. Crista dorsalis visible, relatively low. Megaseta 10 μm long. HR 2.11. HV 2.89.

Female, pupa and larva unknown.

Type materials. Holotype: ♂ (BDN No.05327), China: Fujian Province, Wuyi City, Wuyi Mountain, 27°45'N, 118°03'E, 26.iv.1993, Xinhua Wang, sweep net.

Etymology. The specific name is from Latin, *digitus*, meaning “finger”, referring to the finger-shaped inferior volsella.

Remarks. *P. (P.) digitus* sp.n. is close to *P. (P.) yakuxeyus* (Sasa & Suzuki, 2000) in the antenna ratio (0.71–0.74) and finger-like inferior volsella. But it can be separated from the latter by having rounded anal point reaching beyond the caudal margin of tergite IX, reduced wing anal lobe and bare squama.

Distribution. The new species is known from Fujian Province in Oriental China.

***Pseudorthocladius (Pseudorthocladius) jintutridecima* (Sasa, 1996)**

http://species-id.net/wiki/Pseudorthocladius_jintutridecima

Eukiefferiella jintutridecimus Sasa, 1996: 64.

? *Psectrocladius (Mesopsectrocladius) jintutridecima* Sæther, Ashe & Murray, 2000: 171.

Pseudorthocladius (Pseudorthocladius) jintutridecima Yamamoto 2004: 82; Ashe and O'Connor 2012: 534.

Diagnosis. AR 0.25–0.96; wing anal lobe near rectangular; tergite IX without anal point, just with a strongly chitinized broad and rounded ridge, bearing 13 strong setae; inferior volsella low and round, posterior corner.

Specimens examined. China, Sichuan: 1 ♂, Baoxing County, 30°24'N, 102°54'E, 19.vi.1996, Ruilei Zhang, light trap. Shaanxi: 1 ♂, Liuba County, 33°39'N, 106°57'E, 1.viii.1994, Bingchun Ji, light trap. Fujian: 2 ♂♂ Wuyi City, Wuyi Mountain, 27°45'N, 118°03'E, 26.iv.1993, Xinhua Wang, light trap. Yunnan: 11 ♂♂, Lijiang City, Lijiang County, Shigu town, Chongjiang river, 26°51'N, 100°14'E, 25.v.1996, Xinhua Wang, light trap; 6 ♂♂, Yulong Naxi Autonomous County, Tiger Leaping Gorge, 27°11'24"N, 100°07'12"E, 26.v.1996, Xinhua Wang, light trap. Guangdong: 1 ♂, Fengkai County, 23°24'N, 111°30'E, 20.iv.1988, Xinhua Wang, sweep net.

Remarks. Sasa (1996) described this species based on the material from Japan, and put it in the genus *Eukiefferiella*. Sæther, Ashe and Murray (2000) transferred this species to the genus ? *Psectrocladius*. Yamamoto (2004) transferred it into the genus *Pseudorthocladius*. The Chinese specimens agree with the original description of Sasa (1996) with exception of Chinese specimens have lower AR (0.25–0.86).

Distribution. Shaanxi, Fujian, Guangdong, Sichuan, Yunnan Province (Oriental China); Japan.

Pseudorthocladius (Pseudorthocladius) macrovirgatus Sæther & Sublette, 1983
http://species-id.net/wiki/Pseudorthocladius_macrovirgatus

Pseudorthocladius (Pseudorthocladius) macrovirgatus Sæther & Sublette, 1983: 88; Ashe and O'Connor 2012: 535.

Pseudorthocladius (Pseudorthocladius) cranstoni Sæther & Sublette, 1983: 92; Schnell Ø. A. 1991: 5–10.

Diagnosis. AR 1.04–1.18; R_{4+5} with 0–8 setae, squama with 6–15 setae; virga consisting of 2 broad lateral spines and 4 partially fused median spines, about 0.5×as long as gonostylus; gonostylus well–developed with rounded inferior volsella.

Specimens examined. China, Zhejiang: 1 ♂, Taizhou City, Tiantai County, Baxian Lake, 29°09'N, 120°57'E, 13.iv.2011, Xiaolong Lin, sweep net.

Remarks. The Chinese specimen mainly agrees with the original description by Sæther and Sublette (1983). Some measured differences between the Chinese

Table 6. Differences between the specimens of China and description of Sæther and Sublette (1983).

	Chinese specimen	Description of Sæther & Sublette
TL	2.58 mm	2.46–2.47 mm
WL	1.50 mm	1.07–1.37 mm
VR	1.08	1.15–1.21
LR ₁	0.62	0.57–0.62
HV	2.68	3.57–3.61

specimen and the specimen described by Sæther and Sublette (1983) are shown in Table 6.

Distribution. Zhejiang Province (Oriental China); Europe (Norway; Great Britain; Ireland; France and Netherlands, and North America (U.S.A. and Canada).

Pseudorthocladius (Pseudorthocladius) morsei Sæther & Sublette, 1983

http://species-id.net/wiki/Pseudorthocladius_morsei

Pseudorthocladius (Pseudorthocladius) morsei Sæther & Sublette, 1983: 85; Ashe and O'Connor 2012: 535.

Diagnosis. AR 0.78–0.97; virga consisting of tight cluster of about 10 spines and 2 broader lateral blades; inferior volsella with concave inner margin and 1 anterior and 1 posterior corner; gonostylus with basal inner lobe, a sharp bend distad of the middle, and a narrow apical posterior.

Specimens examined. China, Sichuan: 1 ♂, Kangding County, 29°54'N, 102°06'E, 8.vi.1996, Xinhua Wang, light trap.

Remarks. Sæther and Sublette (1983) described *P. (P.) morsei* based on the material from U.S.A. Its gonostylus has a basal inner lobe, sharply bend distad of the middle and narrow in apical posterior, which is unique among *Pseudorthocladius*. The Chinese specimen agrees with the description except some minor differences shown in Table 7.

Distribution. Sichuan Province (Oriental China); U.S.A.; Canada.

Table 7. Differences between the specimen of China and description of Sæther and Sublette (1983).

	Chinese specimen	Description of Sæther & Sublette
TL	2.53 mm	1.97 mm
WL	1.80 mm	1.19 mm
AR	0.97	0.78
VR	1.12	1.09
LR ₁	0.62	0.59
Virga	consisting of tight cluster of about 8 spines and 2 thin lateral spines	consisting of tight cluster of about 10 spines and 2 broader lateral blades
inferior volsella	rectangular without visible corner	with obvious anterior and posterior corner

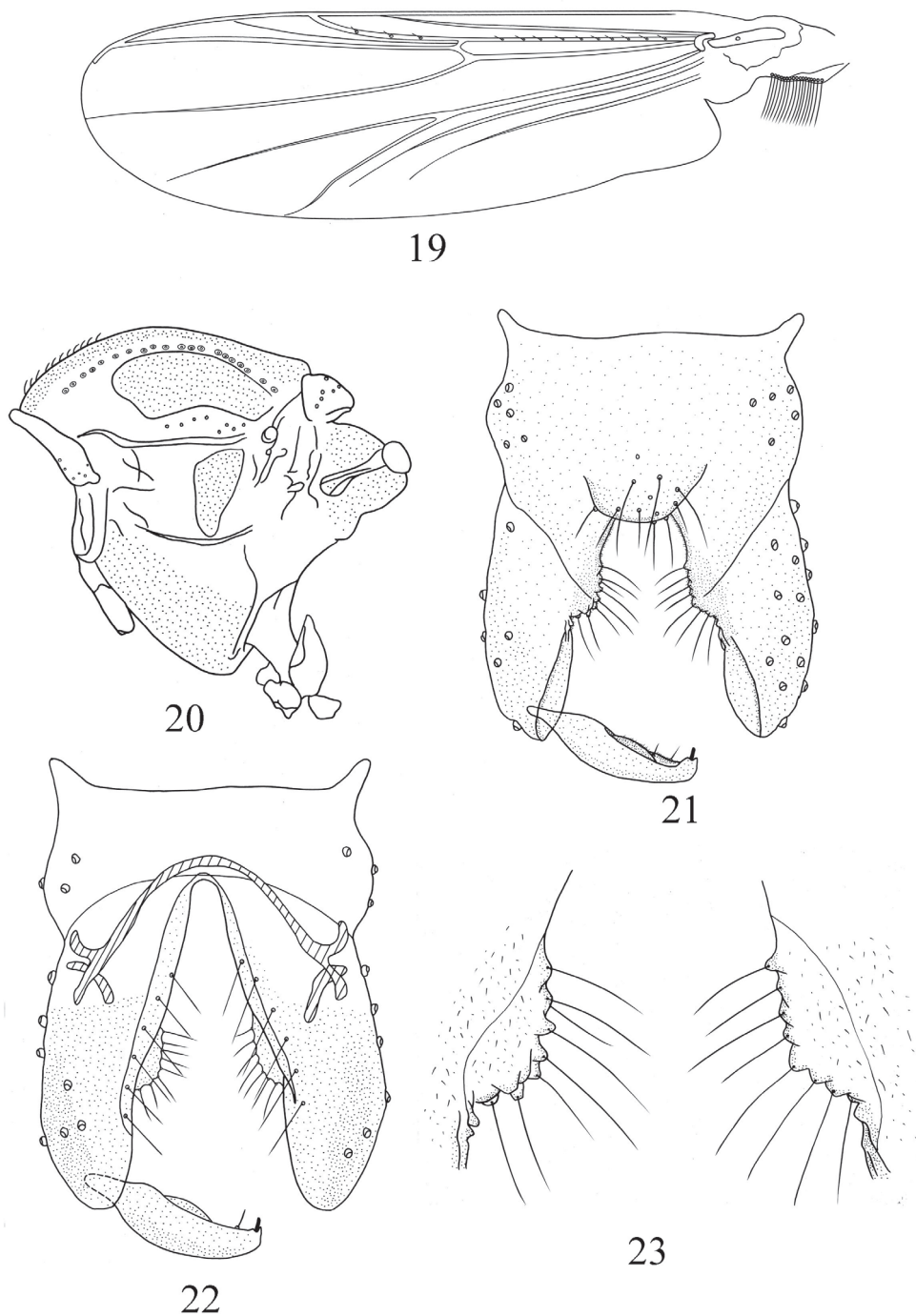
Pseudorthocladius (Pseudorthocladius) ovatus sp. n.

<http://zoobank.org/672C06D7-0A63-4040-BE31-188FCA2FEB77>

http://species-id.net/wiki/Pseudorthocladius_ovatus

Figures 19–23

Diagnosis. The male imago can be distinguished from the known species of the genus by the following combination of characters: anal point round bearing 9 long and strong setae; inferior volsella oval with round margin and bearing 8 long and stout marginal setae; high AR(1.40).



Figures 19–23. *Pseudorthocladius* (*P.*) *ovatus* sp. n., male. **19** wing **20** thorax **21** hypopygium (dorsal view) **22** hypopygium (ventral view) **23** inferior volsella.

Description. Adult male ($n = 5$). Total length 2.90–3.20, 2.98 mm. Wing length 1.43–1.55, 1.47 mm. Total length/wing length 1.88–2.08, 2.00. Wing length/length of profemur 2.26–2.41, 2.35.

Coloration. Head, abdomen, legs brown; thorax with yellow ground with brown preepisternum and brownish black postnotum.

Head. Antenna with 13 flagellomeres. Terminal flagellomere length 410–460, 440 μm . AR 1.31–1.55, 1.40. Temporal setae 8–11, 10, including 3–7, 4 inner verticals, 5–6, 5 outer verticals, and 0–1, 1 postorbital. Clypeus with 8–12, 10 setae. Tentorium 120–132, 126 μm long, 31–33, 32 μm wide. Palpomere lengths (in μm): 31–36, 32; 43–45, 44; 105–108, 107; 155–158, 156; 201–207, 204. L: 5th/3rd 1.81–1.96, 1.91.

Wing (Figure 19). VR 1.19–1.26, 1.21. Anal lobe well-developed. Brachiolium with 1 seta; R with 10–12, 10 setae; R₁ with 3–4, 3 setae; other veins bare. Squama 14–18, 16 setae. Costa extension 36–50, 46 μm long. Cu₁ slightly curved.

Thorax (Figure 20). Anteprepronotum with 5–8, 6 lateral setae, dorsocentrals 20–25, 22, acrostichals 8–12, 10, prealars 7–8, 8. Scutellum with 12–17, 15 setae.

Legs. Pulvilli present. Spur of fore tibia 45–48, 46 μm long, spurs of mid tibia both 19–24, 22 μm long; hind tibia with a long spur 48–52, 50 μm long, a short spur 17–24, 22 μm long and comb composed of 12–14, 13 spines. Width at apex of fore tibia 38–43, 41 μm , of mid tibia 31–40, 36 μm , of hind tibia 43–48, 45 μm . Lengths (in μm) and proportions of legs as in Table 8.

Hypopygium (Figures 21–23). Laterosternite IX with 6–7, 6 setae. Tergite IX with round anal point, bearing 9–10, 9 long and strong setae. Phallapodeme 36–40, 38 μm long. Transverse sternapodeme 72–84, 81 μm long. Virga absent. Gonocoxite 153–168, 162 μm long with oval inferior volsella (Figure 23) with rounded margin and bearing 8 long, stout marginal setae. Gonostylus 89–96, 98 μm long, with small crista dorsalis. Megaseta 5–7, 6 μm long. HR 1.70–1.89, 1.75. HV 3.18–3.23, 3.22.

Female, pupa and larva unknown.

Type materials. Holotype: ♂ (BDN No.26746), China: Zhejiang Province, Wenzhou City, Taishun County, 27°33'N, 119°39'E, 1.viii.2005, Bingchun Ji, light trap.

Table 8. Lengths (in μm) and proportions of legs of *Pseudorthocladius* (*P.*) *ovatus* sp. n.

	P ₁	P ₂	P ₃
fe	600–650, 630	640–700, 670	650–700, 678
ti	720–800, 750	620–670, 648	760–850, 825
ta ₁	480–550 (4), 498	250–330, 280	400–500, 562
ta ₂	310–340 (4), 320	122–156, 148	240–260, 250
ta ₃	210–250 (4), 230	100–115, 110	161–210, 192
ta ₄	140–150 (4), 143	60–72, 66	96–110, 102
ta ₅	90–100 (4), 96	60–72, 66	79–90, 87
LR	0.67–0.69 (4), 0.68	0.41–0.46, 0.43	0.53–0.59, 0.56
BV	2.37–2.76 (4), 2.41	4.04–4.25, 4.17	2.70–3.22, 3.11
SV	2.52–2.69 (4), 2.59	4.24–4.37, 4.32	3.08–3.27, 3.19
BR	1.67–2.22 (4), 1.88	2.65–2.78, 2.70	2.27–2.69, 2.54

Table 9. Main differences between *P. (P.) ovatus* sp. n. and *P. (P.) matusecundus* Sasa and Kawai (1987).

	<i>P. (P.) ovatus</i> sp. n.	<i>P. (P.) matusecundus</i> Sasa & Kawai
AR	1.31–1.55	1.09
palp segment	5	4
inferior volsella	oval with round margin	small with round margin and a small posterior corner
gonostulus	widest at about basal 1/3	widest at about distal 1/3.

Paratypes (4 ♂♂): 3 ♂♂, Zhejiang Province, Tianmu Mountain, 30°19'N, 119°26'E, 8.ix.1998, Xinhua Wang, light trap; 1 ♂, Zhejiang Province, Lishui City, Qingyuan county, 27°39'N, 119°09'E, 13.vii.1994, Hong Wu, sweep net.

Etymology. The specific name is from Latin, *ovatus*, meaning egg-shaped, referring to the oval inferior volsella.

Remarks. The new species is close to *P. (P.) matusecundus* Sasa & Kawai, 1987 in the structure of hypopygium, but can be separated from the latter on the basis of characters in Table 9.

Distribution. The new species is known from Zhejiang Province in Oriental China.

Pseudorthocladius (Pseudorthocladius) paucus sp. n.

<http://zoobank.org/1BEF00CA-4362-49BE-85D9-E161C9E2BDD0>

http://species-id.net/wiki/Pseudorthocladius_paucus

Figures 24–30

Diagnosis. The male imago can be distinguished from the known species of the genus by the following combination of characters: with few setae on squama, R_{4+5} and acrostichals; gonostylus expanded at the apex; anal point triangular barring about 7 stout setae; inferior volsella inserted along the gonocoxite, parallel-sided.

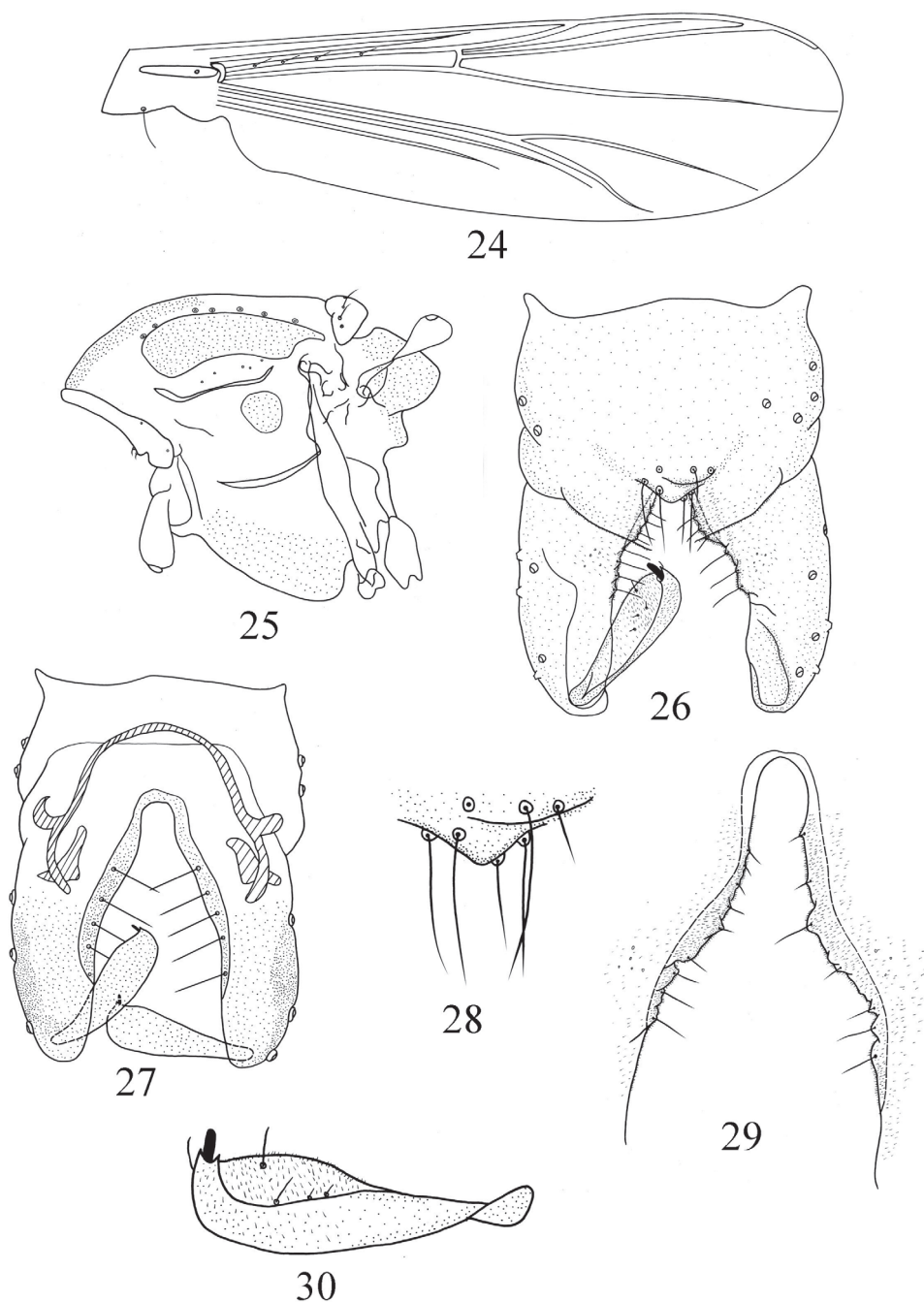
Description. Adult male (n = 3). Total length 1.49–1.60 mm. Wing length 0.77–0.92 mm. Total length/wing length 1.74–1.75. Wing length/length of profemur 2.56–2.58.

Coloration. Head, abdomen, legs light brown; thorax with light brown ground with brownish black postnotum and preepisternum.

Head. Antenna with 13 flagellomeres. Terminal flagellomere length 115–153 μ m, conspicuous swollen apically and with strong sensory setae. AR 0.26–0.48. Temporal setae 5–9, including 2–4 inner verticals, 3–5 outer verticals. Clypeus with 7–10 setae. Tentorium 72–84 μ m long, 14–19 μ m wide. Palpomere lengths (in μ m): 22–24; 24–26; 48–55; 60–65; 91–96. L: $5^{th}/3^{rd}$ 1.62–1.65.

Wing (Figure 24). VR 1.15–1.27. Anal lobe obtuse. Brachiolium with 1 seta; R with 4 setae; R_{4+5} with 0–1 seta; other veins bare. Squama with 0–1 seta. Costa extension 60 μ m long. Cu_1 slightly curved.

Thorax (Figure 25). Anteprepronotum with 4–6 lateral setae, dorsocentrals 6–9, acrostichals 0–1, prealars 4–6. Scutellum with 6–7 setae.



Figures 24–30. *Pseudorthocladius* (*P.*) *paucus* sp. n., male. **24** wing **25** thorax **26** hypopygium (dorsal view) **27** hypopygium (ventral view) **28** anal point **29** inferior volsella **30** gonostylus.

Table 10. Lengths (in μm) and proportions of legs of *Pseudorthocladius* (*P.*) *paucus* sp. n.

	P ₁	P ₂	P ₃
fe	320–360	320–380	430–490
ti	340–360	350–380	370–410
ta ₁	210–250	140–150	200–230
ta ₂	130–160	72–77	108–120
ta ₃	108–130	55–62	91–96
ta ₄	64–67	36–40	41–46
ta ₅	52–55	41–43	41–48
LR	0.62–0.69	0.35–0.40	0.52–0.56
BV	2.27–2.36	3.88–4.17	3.10–3.54
SV	2.88–3.19	4.79–5.07	3.44–3.65
BR	2.20–2.50	3.20–3.40	3.57–4.00

Legs. Pulvilli present. Spur of fore tibia 29–34 μm long, spurs of mid tibia both 17–19 μm long; hind tibia with a long spur 31–33 μm long, a short spur 19–24 μm long and comb composed of 10–12, 11 spines. Width at apex of fore tibia 21–26 μm , of mid tibia 21–24 μm , of hind tibia 24–29 μm . Lengths (in μm) and proportions of legs as in Table 10.

Hypopygium (Figures 26–30). Laterosternite IX with 3–4 setae. Anal point (Figure 28) subtriangular with round apex, 9–10 μm long and 24–26 μm wide, with 4–5 lateral setae and 2–5 long setae around the base. Phallapodeme 22–24 μm long. Transverse sternapodeme 43–48 μm long. Virga absent. Gonocoxite 77–89 μm long with reduced parallel-sided inferior volsella (Figure 29). Gonostylus (Figure 30) 43–50 μm long, expanded at the apex, crista dorsalis reduced. Megaseta 5 μm long. HR 1.60–1.83. HV 2.90–3.25.

Female, pupa and larva unknown.

Type materials. Holotype: ♂ (BDN No.25207), China, Hunan, Hengyang County, Heng Mountain, 27°15'N, 112°51'E, 19.vii.2004, Chuncai Yan, sweep net. Paratypes: 2 ♂♂, Hunan, Dong'an Couny, Shunhuang Mountai, 26°24'N, 111°18'E, 26.vii.2004, Chuncai Yan, sweep net.

Etymology. The specific name is from Latin, *paucus*, meaning “few”, referring to the new species has few setae on squama, R₄₊₅ and acrostichals.

Remarks. The new species resembles *P. (P.) oyabecrassus* Sasa, Kawai & Ueno, 1988 in the low AR (0.43, 0.50), gonostylus strongly expanded at about distal, but can be separated from *P. (P.) oyabecrassus* on the basis of characters in table 11.

Distribution. The new species is known from Hunan Province in Oriental China.

Table 11. Main different characters between *P. (P.) paucus* sp. n. and *P. (P.) oyabecrassus* Sasa, Kawai & Ueno (1988).

	<i>P. (P.) paucus</i> sp. n.	<i>P. (P.) oyabecrassus</i> Sasa, Kawai & Ueno
Body length	1.49–1.60 mm	2.18 mm
Acrostichals	0–1	11
Anal point	subtriangular with round apex	conical, darkly pigment
Pulvilli	present	absent
Inferior volsella	parallel-sided	with a small projection

***Pseudorthocladius (Pseudorthocladius) uniserratus* Sæther & Sublette, 1983**

http://species-id.net/wiki/Pseudorthocladius_uniserratus

Pseudorthocladius (Pseudorthocladius) uniserratus Sæther & Sublette, 1983: 71; Ashe and O'Connor 2012: 538.

Diagnosis. AR 0.63–0.95; R with 3–13 setae, R_1 with 0–6 setae, R_{4+5} with 0–13 setae; squama with 4–6 setae; inferior volsella triangular at middle; virga consisting of very weak field of about 20 minute spinules; crista dorsalis low, HR 1.68–1.91, HV 2.53.

Specimens examined. China: Hunan Province: 1 ♂, Chenzhou City, Yizhang County, Mang Mountain, 25°24'N, 113°18'E, 22.vii.2004, Chuncai Yan, sweep net.

Remarks. Sæther and Sublette (1983) described the male imago, pupa and larva from the U.S.A. The Chinese specimens mainly agree with the adult description of Sæther and Sublette (1983). According to Sæther and Sublette (1983), there are not significant differences between *P. (P.) uniserratus* and *P. (P.) curtistylus* in the male hypopygium, but as we can see in the figures of *P. (P.) uniserratus*, the gonostylus is expanded at about distal while *P. (P.) curtistylus* is narrowed; the inferior volsella is triangular at middle part. The Chinese specimens agree with *P. (P.) uniserratus* more.

Distribution. Oriental China (Hunan Province); U.S.A.; Canada.

***Pseudorthocladius (Lordella) wingoi* Sæther & Sublette, 1983**

http://species-id.net/wiki/Pseudorthocladius_wingoi

Pseudorthocladius (Lordella) wingoi Sæther & Sublette, 1983: 98; Ashe and O'Connor 2012: 530.

Pseudorthocladius (Lordella) comans Sæther & Sublette, 1983: 95; Cranston and Oliver 1988: 446.

Diagnosis. Inferior volsella hook-like, bended posteriad; gonostylus broadest at base and densely covered with microtrichia; virga with 5–8 stronger spines and 0–20 finer spinules; AR 0.8–1.1; dorsocentrals 10–16; R with 1–3 setae, exceptionally with 12 setae.

Specimens examined. China, Guizhou: 8 ♂♂, Fanjing Mountain, 27°54'54"N, 108°41'42"E, 28.v.–3.vi.2002, Bingchun Ji, sweep net.

Remarks. The Chinese specimens mainly agree with the description by Sæther and Sublette (1983). According to Cranston and Oliver (1988), *P. (L.) comans* is a synonym of *P. (L.) wingoi*. Based on the specimens from Canada the shape of the gonostylus is highly dependent on orientation and the spines might be correlated with size, so *P. (L.) comans* and *P. (L.) wingoi* should be the same species. The minor differences between Chinese specimens and North America specimens are as follows: (1) The anal point is a little shorter (12–17 µm); (2) with small AR (0.75–0.86); (3) dorsocentrals 7–8.

Distribution. Oriental China (Guizhou Province); U.S.A.; Canada.

Key to males of the genus *Pseudorthocladius* from China

- 1 Inferior volsella hook–liked, curved posteriad; gonostylus broadest at base and densely covered with microtrichia.....*P. (Lordella) wingoi* Sæther & Sublette
- Inferior volsella rounded, or bluntly triangular, never hook-shaped; gonostylus widest some distance from base or at apex, with less conspicuous microtrichia *P. subg. Pseudorthocladius*
- 2 Wing membrane densely covered with setae.....*P. (P.) cristagus* Stur & Sæther
- Wing membrane bare 3
- 3 Gonostylus with median sharp bend and tapering apex
..... *P. (P.) morsei* Sæther & Sublette
- Gonostylus without median bend and tapering apex..... 4
- 4 Inferior volsella finger-shaped 5
- Inferior volsella rounded or triangular, never finger-shaped..... 6
- 5 Squama with 8 setae, inferior volsella with about 6 stout setae, transverse sternapodeme without oral projection.....*P. (P.) jintutridecima* (Sasa)
- Squama bare, inferior volsella with few weak setae, transverse sternapodeme with oral projection *P. (P.) digitus* sp.n.
- 6 Virga consisting of 2 broader lateral spines and 4 partially fused median spines..... *P. (P.) macrovirgatus* Sæther & Sublette
- Virga absent, if present then consisting of fine spinules..... 7
- 7 Anal point long and cylindrical..... *P. (P.) cylindratus* sp.n.
- Anal point round or subtriangular 8
- 8 Inferior volsella with two lobes *P. (P.) binarius* sp.n.
- Inferior volsella with only one lobe 9
- 9 AR 0.26–0.48, acrostichal 0–1, R with 4 setae, dorsocentrals 6–9
..... *P. (P.) paucus* sp.n.
- AR ≤ 0.64 or ≥ 1.31 , acrostichals 8–14, R with 10–13 setae, dorsocentrals 12–25 10
- 10 AR 1.31–1.55, squama 14–18, dorsocentrals 20–25, anal point rounded
..... *P. (P.) ovatus* sp.n.
- AR 0.45–0.64, squama 3–4, dorsocentrals 12–18, anal point triangular ... 11
- 11 AR 0.45–0.51, crista dorsalis rounded and protruding.....
..... *P. (P.) curtistylus* (Goetghebuer)
- AR 0.63–0.81, crista dorsalis lower and less rounded.....
..... *P. (P.) uniserratus* Sæther & Sublette

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New species and records of *Metriocnemus* van der Wulp s. str. from China (Diptera, Chironomidae)

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Abstract

The Chinese species of *Metriocnemus* van der Wulp s. str., 1874 is reviewed. *M. (M.) calcaneum* sp. n. is described and illustrated as adult male. *M. (M.) albolineatus* (Meigen) is recorded from China for the first time. *M. (M.) beringensis* (Cranston & Oliver), *M. (M.) bilobatus* Makarchenko & Makarchenko, *M. (M.) caudigus* Sæther, *M. (M.) intergerivus* Sæther, *M. (M.) tamaokui* Sasa and *M. (M.) tristellus* Edwards are recorded from the Oriental Region for the first time. A key to the males of 17 Chinese *Metriocnemus* (*Metriocnemus*) species is given.

Keywords

Chironomidae, *Metriocnemus*, new species, new records, China

Introduction

The genus *Metriocnemus* van der Wulp was erected in 1874; Coquillett (1910) subsequently designated *Chironomus albolineatus* Meigen, 1818 as the type species. Langton and Cobo (1997) described subgenera *Inermipupa* based on a species with a highly aberrant pupa (*Metriocnemus (Inermipupa) camencitabertarum*). Subsequently Ashe and

O'Connor (2000) erected the subgenus *Crymaleomiva* for a species which not fully fits the larva, pupa or adult diagnosis of the genus (*Metriocnemus* (*Crymaleomiva*) *brunneri*).

The genus is found in mosses, phytotelmata, springs, ditches, streams and occasionally in the middle of lakes and rock pools (Cranston, Oliver and Sæther 1989, Sæther 1989). The genus presently includes 67 recorded species and had a worldwide distribution. Twelve species occur in the Oriental Region, 38 in the Palearctic Region, 15 in the Nearctic Region, 7 in the Neotropical Region, 6 in the Afrotropical Region and one in the Australasian Region (Ashe and O'Connor 2012). Grounded on virga present or absent, Sæther (1995) divided the genus into two main groups, the *eurynotus* group (with well developed virga) and the *fuscipes* group (without virga).

Regarding taxonomic study on the genus *Metriocnemus* in China, Sæther (1995) recorded 7 species including 3 species originally described from China. Wang (2000) listed ten species of *Metriocnemus* from China, among which the species of *M. gracei* Edwards, 1929 should be *M. tristellus* Edwards after we re-examined the specimen. Based on new material from China, one new species is described below and seven additional species are newly recorded. A key to the males of the *Metriocnemus* s.str. species occurring in China is presented.

Material and methods

The material examined was mounted on slides in Canada balsam, following the procedure outlined by Sæther (1969). The morphological nomenclature follows Sæther (1980). Measurements are given as ranges.

The types and other examined material in this study are housed in the College of Life Sciences, Nankai University, China (BDN).

The species

Metriocnemus (*Metriocnemus*) *aculeatus* Chaudhuri & Bhattacharyay

http://species-id.net/wiki/Metriocnemus_aculeatus

Metriocnemus aculeatus Chaudhuri & Bhattacharyay in Chaudhuri et al. (1989:309), Sæther (1995:55), Wang (2000:637).

Material examined. CHINA: Sichuan Province, Jinpo Mountain, 30°3'30"N, 103°53'15"E, 1 male, 9.v.1986, light trap, X. Wang. Fujian Province, Wuyi Mountain, 27°43'46"N, 118°1'52"E, 4 males, 28–30.iv.1993, light trap, X. Wang. Guizhou Province, Fanjing Mountain, Huguo Temple, 27°54'43"N, 108°38'35"E, 4 males, 2–4.vii.2001, light trap, R. Zhang.

Remarks. The species differs from all other *Metriocnemus* species by the wing chaetotaxy, the characteristic hypopygium with very long, sharply pointed anal point and a gonostylus lacking crista dorsalis. The Chinese specimens has higher antennal ratio (AR = 1.00–1.73) than the Indian specimens (AR = 1.09). Among the specimens of China, one was identified as *M. hirticollis* (Staeger, 1839), which should be *M. (M.) albolineatus* (Meigen, 1818) after we re-examined the specimen.

Distribution. *Metriocnemus (M.) aculeatus* has been recorded from India (Chaudhuri et al. 1989) and the Oriental China.

***Metriocnemus (Metriocnemus) albolineatus* (Meigen)**

http://species-id.net/wiki/Metriocnemus_albolineatus

Chironomus albolineatus Meigen, 1818:39

Chironomus atratulus Zetterstedt, 1850:3590

Metriocnemus albolineatus (Meigen); Sæther (1989:399)

Material examined. CHINA: Sichuan Province, Ganzi City, Yajiang County, 29°53'48"N, 103°10'19"E, 1 male, 14.vi.1986, light trap, X. Wang.

Remarks. The male can be separated from other species of *Metriocnemus* by having a short virga (23–26 µm long), very weak inferior volsella, rounded to bluntly triangular crista dorsalis, tapering anal point with blunt apex, Sc with 10–31 setae, M with 15–32 setae, and cell m with 35–73 setae. This species is a member of the *eurynotus* group, but the male can be separated from other species of the group by having a shorter virga and a weaker inferior volsella. It has more setae on the wings than *M. (M.) brusti* and *M. (M.) corticalis*, but fewer than *M. (M.) eurynotus*.

Distribution. The species is recorded from the Nearctic, Palaearctic and Oriental regions (Ashe and O'Connor 2012). In China it was collected from Sichuan Province in Oriental China for first time.

***Metriocnemus (Metriocnemus) beringensis* (Cranston & Oliver)**

http://species-id.net/wiki/Metriocnemus_beringensis

Apometriocnemus beringensis Cranston & Oliver, 1988:428

Metriocnemus beringensis (Cranston & Oliver); Sæther (1995:59)

Material examined. CHINA: Tibet, Zhangmu, 28°46'26"N, 87°30'22"E, 1 male, 15.viii.1987, light trap, C. Deng. Tibet, Zhangmu, 28°46'26"N, 87°30'22"E, 1 male, 6.ix.1987, light trap, C. Deng.

Remarks. *Metriocnemus (M.) beringensis* may be no more than a small form of *M. (M.) fuscipes* (Meigen, 1818) differing in having a strongly reduced or absent anal

point and slightly fewer setae on squama. Chinese specimens have fewer setae (R with 18–28, R_1 with 18–20, R_{4+5} with 15–38 setae) on the wing than Norwegian specimens (R with 39–69, 55, R_1 with 27–47, 36, R_{4+5} with 37–81, 59 setae) (Sæther 1995).

Distribution. The species is previously recorded from the Nearctic and Palaearctic regions (Ashe and O'Connor 2012). In China it was collected in Tibet in Oriental China for first time.

***Metriocnemus (Metriocnemus) bilobatus* Makarchenko & Makarchenko**

http://species-id.net/wiki/Metriocnemus_bilobatus

Metriocnemus bilobatus Makarchenko & Makarchenko, 2004:216

Material examined. CHINA: Sichuan Province, Kangding City, Ertazidaoban, 30°2'20"N, 101°50'6"E, 1 male, 15.vi.1996, water net, X. Wang. Sichuan Province, Litang County, 29°59'45"N, 100°16'11"E, 1 male, 11.vi.1996, light trap, X. Wang.

Remarks. This species can be separated from other *Metriocnemus* species by having a total length of 2.18–2.42 mm, wing length of 1.85–2.25 mm, AR = 0.23–0.26, acrostichals in 2 rows, 25–37 dorsocentrals, and reduced anal lobe of the wing. The anal point is 45–48 µm long, and lacking microtrichia in distal half. Virga is 50–53 µm long and consists of a single spine. The inferior volsella is bilobate, and the length of the basal lobe is about half the length of the gonocoxite.

Distribution. The species is recorded from Russian Far East (Makarchenko and Makarchenko 2004). In China it was collected in Sichuan Province in Oriental China for first time.

***Metriocnemus (Metriocnemus) brusti* Sæther**

http://species-id.net/wiki/Metriocnemus_brusti

Metriocnemus brusti Sæther, 1989:407; Wang (2000:637).

Material examined. CHINA: Hebei Province, Pingquan County, Guangtou Mountain, 41°1'43"N, 118°43'1"E, 1 male, 29.vi.1995, light trap, H. Li. Guizhou Province, Daozhen County, Xiaosha River, 29°10'45"N, 107°32'59"E, 1 male, 25.v.2004, light trap, H. Tang.

Remarks. According to Sæther (1989), the male can be separated from other members of *Metriocnemus* by having rounded crista dorsalis, anal point tapering to blunt apex, well sclerotized virga, comparatively sparsely haired wing with about 0–8 setae on Sc, 0–11 on M, 0–14 on PCu and 7–9 setae in cell m, and squama with 27–34 setae. The Chinese specimens have slightly more setae on wing membrane, with about 2–9 setae on Sc, 12–14 on M, 35–48 on PCu and 13–16 setae in cell m, but squama only with 15–17 setae. The species is similar to *M. (M.) albilineatus* (Meigen,

1818) and *M. (M.) eurynotus*, but has tapering anal point and rounded crista dorsalis. It has a well developed virga as in *M. (M.) corticalis* and differs from this species in minor details in the wing chaetotaxy and the hypopygium.

Distribution. The species is recorded from the Nearctic and Palaearctic regions (Ashe and O'Connor 2012). It was collected in both Oriental and Palaearctic China.

***Metriocnemus (Metriocnemus) calcaneum* sp. n.**

<http://zoobank.org/2A5C2FA0-54B9-46E6-90BA-A6D3FD4558C1>

http://species-id.net/wiki/Metriocnemus_calcaneum

Figs 1–3

Type material. Holotype male (BDN No. 08832), CHINA: Hebei Province, Pingquan County, Guangtou Mountain, 41°1'43"N, 118°43'1"E, 29.vi.1995, light trap, W. Bu. Paratype male (BDN No. 08816), as holotype except the date is 28.vi.1995.

Diagnostic characters. The gonostylus is 83–90 µm long, with short, strong outer projection; crista dorsalis is strong and pointed; LR_1 is high (0.68–0.70); squama with 8–10 setae; and cell m basally of RM with 15 setae.

Etymology. From Latin, *calcaneum* meaning the heel, referring to the short, strong outer projection on gonostylus. The species epithet is a noun in apposition.

Description. Male (n = 2).

Total length 2.49–2.68 mm. Wing length 1.68–1.88 mm. Total length / wing length 1.43–1.48. Wing length / length of profemur 2.09–2.23.

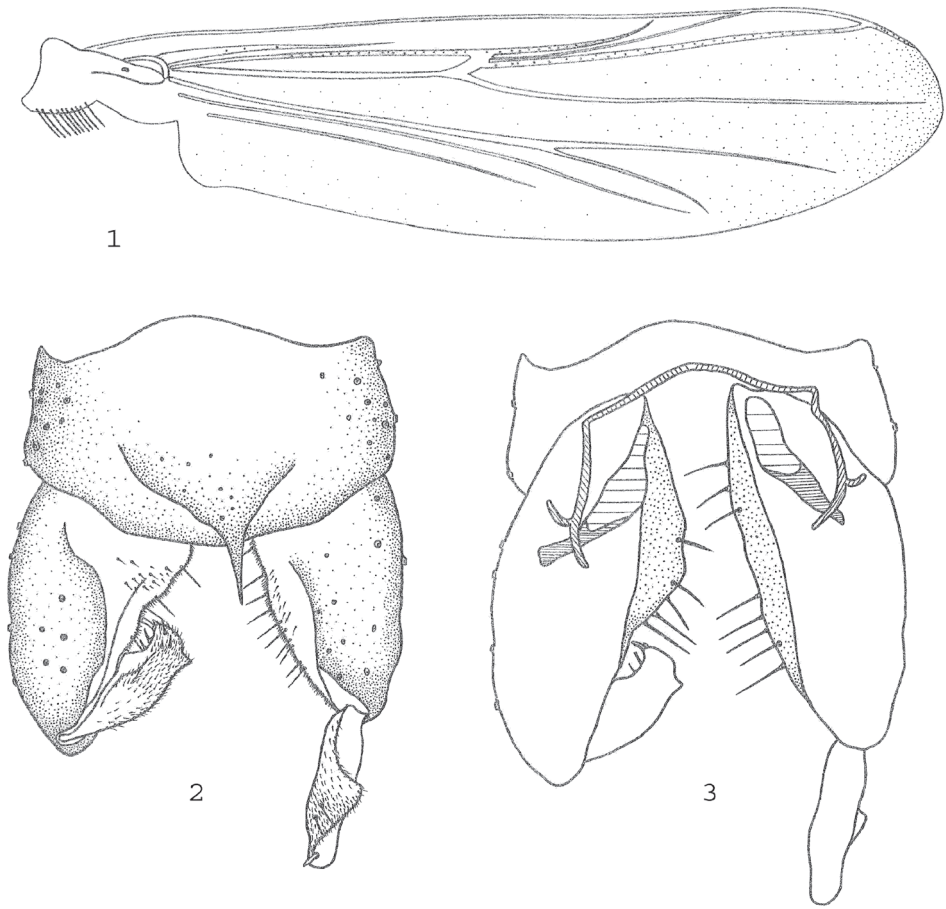
Coloration. Head and abdomen brown, thorax and legs yellow.

Head. AR 1.43–1.58. Temporal setae 11, including 4 inner verticals, 3 outer verticals, and 4 postorbitals. Clypeus with 10–12 setae. Tentorium 123–150 µm long, 18–20 µm wide. Stipes 105–108 µm long, 25–40 µm wide. Palp segments lengths (in µm): 18–40, 43, 135–155, 105–118, 153–165. Length ratio of palpomere 5/3 1.06–1.13.

Wing (Fig. 1). VR 1.16–1.34. Costal extension 110–150 µm long. Brachiolium with 1 seta, C extension with 8 non-marginal setae, Sc with 2–3, R with 18–19, R_1 with 16–17, R_{4+5} with 25–32, RM with 1, M with 0–2, M_{1+2} with 26, M_{3+4} with 20, Cu with 0, Cu_1 with 7 setae. Pcu and An without setae. Wing membrane with setae in most cells, with 15 setae in cell m basally of RM, cell r_{4+5} with 74–105, cell m_{1+2} with 108–135, cell m_{3+4} with 21–38 setae. Squama with 8–10 setae.

Thorax. Anteprepronotum with 1–2 setae. Dorsocentrals 10–12, acrostichals 8–9, prealars 5. Scutellum with 7–8 setae.

Legs. Spur of fore tibia 53–75 µm long, spurs of mid tibia 33–35 µm and 25–28 µm long, of hind tibia 53–58 µm and 28 µm long. Width at apex of fore tibia 38–43 µm, of mid tibia 35–43 µm, of hind tibia 45–50 µm. Comb of 12 setae, shortest 20–23 µm long, longest 50–63 µm long. First tarsomere of mid leg with 1 pseudospur, 20 µm long; hind leg without pseudospurs. Lengths (in µm) and proportions of legs as in Table 1.



Figures 1–3. *Metriocnemus (Metriocnemus) calcaneum* sp. n., male. **1** wing **2** hypopygium (dorsal view) **3** hypopygium (ventral view).

Table 1. Lengths (in μm) and proportions of legs segments of *Metriocnemus (Metriocnemus) calcaneum* sp. n., male (n = 2).

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄
P ₁	800–840	830–950	580–650	310–370	198–224	136–150
P ₂	790–890	750–860	400–430	185–198	150–155	108
P ₃	840–970	920–1060	520–570	242–264	185–220	114–123
	ta ₅	LR	BV	SV	BR	
P ₁	98–105	0.68–0.70	2.87–2.98	2.75–2.81	2.0	
P ₂	88–98	0.50–0.53	3.63–3.94	3.85–4.07	2.44–3.3	
P ₃	93–98	0.54–0.57	3.60–3.69	3.38–56	2.91–4.0	

Hypopygium (Figs 2–3). Anal point proper 30–45 µm long, 23–25 µm wide, tapering from base to pointed apex; with 8–11 setae at base on tergite IX. Lateros-tergite IX with 10–13 setae. Phallapodeme 48–53 µm long; transverse sternapodeme 110–133 µm long. Gonocoxite 223–224 µm long. Gonostylus 83–90 µm long, with short, strong outer projection; crista dorsalis strong and pointed; megaseta 13 µm long. HR 2.49–2.70. HV 2.76–3.24.

Distribution. The specimens were collected in Hebei Province in Palaearctic China.

***Metriocnemus (Metriocnemus) calvescens* Sæther**

http://species-id.net/wiki/Metriocnemus_calvescens

Metriocnemus calvescens Sæther, 1995:45; Wang (2000:637).

Material examined. CHINA: Qinghai Province, Menyuan County, Haibei Station, 37°22'33"N, 101°37'20"E, 3 males, 12.vii.1989, light trap, M. Wei.

Remarks. This species apparently forms the sister species of *M. ursinus* (Holmgren, 1869). It can be separated from *M. (M.) ursinus* on its smaller size, by having only 27 setae in cell r_{4+5} , only 26 setae on scutellum, and the presence of pseudospurs on fore metatarsus (Sæther 1995). Compare to the holotype, the measurements of the two more males are very similar, except only 8–15 setae on scutellum.

Distribution. The species was described by Sæther (1995) in Qinghai Province in Palaearctic China based on a single male specimen. Later two more male slides have been made which collected in the same location as the holotype.

***Metriocnemus (Metriocnemus) caudigus* Sæther**

http://species-id.net/wiki/Metriocnemus_caudigus

Metriocnemus caudigus Sæther, 1995:52; Wang (2000:367).

Material examined. CHINA: Fujian Province, Wuyi Mountain, 27°43'46"N, 118°1'52"E, 1 male, 28.iv.1993, light trap, X. Wang.

Remarks. This species can be separated from other species of *Metriocnemus* by having a slender gonostylus with long, low crista dorsalis; a robust, long anal point; and an AR of 1.0–1.5. The Chinese specimen has a slightly higher 5th/3rd palp ratio (0.79–0.94) than the Norwegian specimens (0.70). Further, the Chinese specimen has 2 pseudospurs, 24–32 µm long, on tarsomere 1 and 1 pseudospur, 20–28 µm long on tarsomere 2 of mid and hind legs, while the Norwegian specimens have 1 pseudospur, 23–38 µm long, on tarsomere 1 of mid and hind legs only.

Distribution. The species was described from Norway by Sæther (1995). In China it was collected in Fujian Province in Oriental China.

***Metriocnemus (Metriocnemus) dentipalpus* Sæther**

http://species-id.net/wiki/Metriocnemus_dentipalpus

Metriocnemus dentipalpus Sæther, 1995:44

Material examined. Holotype (ZMB No.145): CHINA: Tibet, Dingri, Chang Street, 28°39'31"N, 87°7'34"E, 1 male, 16.ix.1987, light trap, C. Deng.

Remarks. The species is similar to *M. (M.) brusti* Sæther, 1989 and *M. (M.) acutus* Sæther, 1995 but can be separated on having 20 setae on vein M, an AR = 1.43, palp with a small apical tooth on each of palpomeres 3 and 4, anal point with concave margins and details of the hypopygium. *M. (M.) brusti* only have 0–14 setae and *M. (M.) acutus* without setae on vein M.

Distribution. The species is known only from Tibet in Oriental China by Sæther (1995).

***Metriocnemus (Metriocnemus) eurynotus* (Holmgren)**

http://species-id.net/wiki/Metriocnemus_eurynotus

Chironomus obscuripes Holmgren, 1869:8, preoccupied

Chironomus eurynotus Holmgren, 1883:179

Metriocnemus eurynotus (Holmgren); Sæther (1995:44); Wang (2000:637)

Material examined. CHINA: Gansu Province, Yuzhong County, 35°50'35"N, 104°6'45"E, 1 male, 8.viii.1993, light trap, X. Wang. Sichuan Province, Jinpo Mountain, 30°3'30"N, 103°53'15"E, 1 male, 9.v.1986, light trap, X. Wang.

Remarks. The male can be recognized on the completely parallel-sided anal point with broad, rounded apex; and the sharply triangular crista dorsalis.

Distribution. The species is recorded from the Nearctic, Palaearctic and Oriental regions (Ashe and O'Connor 2012). The species has been collected in both Oriental and Palaearctic China.

***Metriocnemus (Metriocnemus) fuscipes* (Meigen)**

http://species-id.net/wiki/Metriocnemus_fuscipes

Chironomus fuscipes Meigen, 1818:49

Metriocnemus fuscipes (Meigen); van der Wulp (1875:136); Sæther (1989:423, 1995:58); Wang (2000:637)

Material examined. CHINA: Ningxia Hui Autonomous Region, Liupan Mountain, 35°47'22"N, 106°17'36"E, 1 male, 4.viii.1987, light trap, W. Wang. Liaoning Province,

Changbai Mountain, 41°2'40"N, 122°37'38"E, 1 male, 1.v.1994, light trap, X. Wang. Tibet, Yadong County, 27°29'5"N, 88°54'25"E, 1 male, 29.viii.2003, light trap, H. Xue.

Remarks. This species is easily recognized by the lack of virga, pointed anal point, low inferior volsella with apical hump, LR_3 only 0.38–0.39 and $AR = 0.9$ – 1.2 (Sæther 1989). The Chinese specimens have a slightly higher AR (1.28–1.42) than that given by Sæther (1989) ($AR = 0.86$ – 1.17).

Distribution. The species is recorded from the Nearctic and Palaearctic regions (Ashe and O'Connor 2012). In China the species was collected in Palaearctic China.

***Metriocnemus (Metriocnemus) intergerivus* Sæther**

http://species-id.net/wiki/Metriocnemus_intergerivus

Metriocnemus intergerivus Sæther, 1995:52

Material examined. CHINA: Hubei Province, Enshi Tujia and Miao Autonomous Prefecture, He Mountain, Fenshuiling, 29°53'24"N, 110°2'1"E, 2 males, 12–16.vii.1999, light trap, B. Ji. Hubei Province, Enshi Tujia and Miao Autonomous Prefecture, Xianfeng County, Pingba, 29°24'57"N, 109°8'18"E, 2 males, 20.vii.1999, light trap, B. Ji. Liaoning Province, Changbai Mountain, 41°2'40"N, 122°37'38"E, 2 males, 1.v.1994, light trap, X. Wang. Sichuan Province, Daocheng County, Sangdui, 29°11'28"N, 100°6'32"E, 1 male, 13.vi.1996, light trap, X. Wang.

Remarks. The male imago combines a well developed virga with a low crista dorsalis, weak anal point, and low inferior volsella typical of the *fuscipes* group. The species has an $AR = 1.78$ – 2.42 .

Distribution. The species is recorded from the Nearctic and Palaearctic regions (Ashe and O'Connor 2012). It is known from both Oriental and Palaearctic China for first time.

***Metriocnemus (Metriocnemus) picipes* (Meigen)**

http://species-id.net/wiki/Metriocnemus_picipes

Chiromomus picipes Meigen, 1818

Chironomus paganicus Walker, 1856:183

Metriocnemus hirtipalpis Kieffer, 1915:478

Metriocnemus longipalpus Sinharay & Chaudhuri, 1978:281

Metriocnemus picipes (Meigen); van der Wulp (1874:136); Edwards (1929:311); Pinder (1978:90), Sæther (1995:59); Wang (2000:637)

Material examined. CHINA: Jilin Province, Changbai Mountain, 41°2'40"N, 122°37'38"E, 1 male, 7.vii.1986, light trap, X. Wang. Yunan Province, Songhua Coun-

ty, 25°11'38"N, 109°8'18"E, 1 male, 1.vi.1996, light trap, B. Wang. Hebei Province, Pingquan County, Guangtou Mountain, 41°1'43"N, 118°43'1"E, 1 male, 29.vi.1995, light trap, H. Li. Sichuan Province, Daocheng County, Sangdui, 29°11'28"N, 100°6'32"E, 2 males, 13.vi.1996, light trap, X. Wang. Hubei Province, Deduo Mountain, Fenshui ling, 29°40'8"N, 109°5'12"E, 1 male, 16.vi.1999, light trap, B. Ji.

Remarks. The Chinese specimens have a low number of setae on each of subcosta (0–9, 2) and M (4–20, 12), combined with a high AR (1.89–2.90, 2.24) and LR_3 (0.44–0.50, 0.46), and a conspicuously long spur of the fore tibia (2.0–2.4 times as long as the apical width of tibia), these characters will distinguish the species from other members of *Metriocnemus*. *Metriocnemus wittei* Freeman, 1955 from Africa might be a synonym (Sæther 1995).

Distribution. The species is recorded from the Nearctic, Palaearctic and Oriental regions (Ashe and O'Connor 2012). It has been collected in both Oriental and Palaearctic China.

***Metriocnemus (Metriocnemus) tamaokui* Sasa**

http://species-id.net/wiki/Metriocnemus_tamaokui

Metriocnemus tamaokui Sasa, 1983:77

Material examined. CHINA: Sichuan Province, Daocheng City, Sangdui County, 29°11'28"N, 100°6'32"E, 1 male, 11.vi.1996, sweep net, X. Wang. Yunnan Province, Dali County, Yinqiao, 25°45'10"N, 109°5'12"E, 1 male, 21.v.1996, light trap, B. Wang. Xinjiang Uygur Autonomous Region, Yining City, Saimuli Lake, 44°37'26"N, 81°12'28"E, 1 male, 30.vii.2000, light, trap, N. Tang.

Remarks. The species has an AR = 1.13; very long palp; wing with numerous macrotrichia; ta_1 and ta_2 of mid and hind leg each with 2 pseudospurs; virga composed of nearly 20 spines; anal point robust, partly parallel-sided; a strongly projecting, rectangular inferior volsella in basal half of the gonocoxite; and a triangular, preapical crista dorsalis.

Distribution. The species was described from Japan (Sasa 1983), and it is a newly recorded in China. It is known from both Oriental and Palaearctic China.

***Metriocnemus (Metriocnemus) tristellus* Edwards**

http://species-id.net/wiki/Metriocnemus_tristellus

Metriocnemus tristellus Edwards, 1929:312

Metriocnemus gracei Edwards, 1929:312 sensu Wang 2000:637.

Material examined. CHINA: Zhejiang Province, Qingyuan City, Baishanzu County, 27°43'51"N, 100°7'33"E, 2 males, 18–22.iv.1994, light trap, H. Wu.

Remarks. The species has an $AR = 1.2$, very low inferior volsella, and weak anal point. Basal half of the wing membrane is bare, costa is strongly produced, and the distance C–M is rather less than M–Cu. The palp is unusually short, palpomeres 3 and 4 are less than three times as long as broad, palpomere 2 is rather longer. Wang (2000) recorded *M. gracei* Edwards, 1929 from China, which should be *M. (M.) tristellus* Edwards after we re-examined the specimen.

Distribution. The species is recorded from the Nearctic and Palearctic regions (Ashe and O'Connor 2012). The species has been collected in Oriental China for first time.

***Metriocnemus (Metriocnemus) unilinearis* Chaudhuri & Bhattacharyay**

http://species-id.net/wiki/Metriocnemus_unilinearis

Metriocnemus unilinearis Chaudhuri & Bhattacharyay in Chaudhuri et al. 1989:312; Sæther (1995:56); Wang (2000:637)

Material examined. CHINA: Tibet, Zhangmu, 28°46'26"N, 87°30'22"E, 1 male, 7.ix.1987, light trap, C. Deng. Tibet, Zhangmu, 28°46'26"N, 87°30'22"E, 1 male, 21.ix.1987, light trap, C. Deng. Tibet, Zhangmu, 28°46'26"N, 87°30'22"E, 1 male, 9.viii.1987, light trap, C. Deng. Guizhou Province, Fanjing Mountain, Huguo Temple, 27°54'43"N, 108°38'35"E, 1 male, 4.viii.2001, light trap, R. Zhang. Fujian Province, Wuyi Mountain, Tongmu County, 27°43'46"N, 118°1'52"E, 2 males, 29.iv.1993, sweep net, W. Bu.

Remarks. This species can be separated from other *Metriocnemus* species by the following combination of characters: acrostichals 4–5, uniserial; scutellum with 12 irregularly arranged setae; squama with 7 setae; anal point narrow and pointed with 14 setae at base, and gonocoxite with a small, dorsal, flap-like setose lobe. The specimens from Tibet have a lower antennal ratio ($AR = 0.66–0.88$) than the Indian specimens ($AR = 1.03$).

Distribution. This species was described from India (Chaudhuri et al. 1989). It has been collected in both Oriental and Palearctic China.

***Metriocnemus (Metriocnemus) wangi* Sæther**

http://species-id.net/wiki/Metriocnemus_wangi

Metriocnemus wangi Sæther, 1995:41; Wang (2000:637)

Material examined. CHINA: Sichuan Province, Jinpo Mountain, 30°3'30"N, 103°53'15"E, 2 males [holotype / paratype], 10.v.1986, light trap, X. Wang.

Remarks. We examined the holotype and paratype specimens which are described by Sæther (1995) from China. According to Sæther (1995), the male can be separated from all other members of the *euryotus* group except *M. (M.) albolineatus* by the short

virga (about 26µm long), subcosta with 42–70 setae, and cell m with 113–144 setae. The species is close to *M. (M.) albolineatus* sharing the short virga and general wing chaetotaxy. It differs from *M. (M.) albolineatus* by having an AR = 0.5–0.6 and a much shorter anal point.

Distribution. This species was only described from Oriental China by Sæther (1995).

Key to adult males of *Metriocnemus* s. str. in China

- 1 Gonostylus with short, strong outer projection *M. (M.) calcaneum* sp. n.
- Gonostylus without strong outer projection..... 2
- 2 Basal half of wing membrane bare or at most with scattered setae in anal cell.... 3
- Entire wing membrane, except sometimes cell m basally of RM, densely clothed with setae 6
- 3 AR = 0.23–0.26; virga consists of 1 spine
..... *M. (M.) bilobatus* Makarchenko & Makarchenko
- AR = 0.84–2.71; without virga or virga consists of about 10 spines 4
- 4 Anal point weak, tapering to a point; a few setae present in anal cell of wing; crista dorsalis low or absent, squama with about 4–11 setae..... 5
- Anal point robust, rounded apically; basal half of wing membrane bare; crista dorsalis bluntly triangular; squama with 27 setae .. *M. (M.) calvescens* Sæther
- 5 Inferior volsella very low; without virga *M. (M.) tristellus* Edwards
- Inferior volsella distinct; virga present.....
..... *M. (M.) aculeatus* Chaudhuri & Bhattacharyay
- 6 Virga consisting of 6–14 spines; crista dorsalis preapical and triangular or occasionally long and low or gonostylus with strong preapical projection 7
- Virga absent, crista dorsalis long and low 14
- 7 Crista dorsalis long and low 8
- Crista dorsalis preapical, triangular, pointed to rounded 9
- 8 Anal point robust, rounded at apex, 49–68 µm long; AR about 1.3; squama with 18–23 setae..... *M. (M.) caudigus* Sæther
- Anal point weak, pointed, 15–26 µm long; AR = 2.0–2.4; squama with 43–64 setae..... *M. (M.) intergerivus* Sæther
- 9 Inferior volsella in basal half of gonocoxite, rectangular, strongly projecting ...
..... *M. (M.) tamaokui* Sasa
- Inferior vosella in basal 0.58–0.80 of gonocoxite, widest in basal half, weak to pronounced 10
- 10 Subcosta with 0–8 setae, cell m basally of RM with 0–29 setae..... 11
- Subcosta with 10–55 setae, cell m basally of RM with 40–144 setae..... 12
- 11 Vein M with 0–11 setae, third and fourth palpomere without small, sclerotized apical tooth; anal point triangular *M. (M.) brusti* Sæther
- Vein M with about 20 setae, third and fourth palpomere with small, sclerotized apical tooth; anal point with concave margins *M. (M.) dentipalpus* Sæther

- 12 Spines of virga 23–26 μm long, crista dorsalis rounded to bluntly triangular 13
- Spines of virga 34–68 μm long, crista dorsalis either sharply triangular or rounded *M. (M.) eurynotus* (Holmgren)
- 13 AR = 0.5–0.6, anal point 24–28 μm long *M. (M.) wangi* Sæther
- AR = 1.2–1.5, anal point 51–64 μm long ... *M. (M.) albolineatus* (Meigen)
- 14 LR_1 = 0.55–0.67, LR_3 = 0.37–0.49, squama with 19–46 setae 15
- LR_1 about 0.66–0.88, LR_3 about 0.54–0.59, squama with 7–10 setae
..... *M. (M.) unilinearis* Chaudhuri & Bhattacharyay
- 15 AR = 0.70–1.42; pseudospurs often absent on ta_2 of hind leg 16
- AR = 1.89–2.49; pseudospurs always present on ta_2 of hind leg
..... *M. (M.) picipes* (Meigen)
- 16 Anal point absent or at most 15 μm long; LR_1 = 0.81–0.84
..... *M. (M.) beringensis* (Cranston & Oliver)
- Anal point strong, 43–53 μm long; LR_1 = 0.57–0.60
..... *M. (M.) fuscipes* (Meigen)

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The collection and database of Birds of Angola hosted at IICT (Instituto de Investigação Científica Tropical), Lisboa, Portugal

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Abstract

The bird collection of the Instituto de Investigação Científica Tropical (Lisbon, Portugal) holds 5598 preserved specimens (skins), mainly from Angola, Mozambique, Guinea-Bissau, São Tomé and Príncipe, and Cape Verde. The subset collection from Angola includes 1560 specimens, which were taxonomically revised and georeferenced for the publication of this data paper. The collection contains a total of 522 taxa, including 161 species and 361 subspecies. Two species are classified by the IUCN Red List as Endangered

- the wattled crane (*Grus carunculata*) and the Gabela bush-shrike (*Laniarius amboimensis*) - and two are classified as vulnerable - African penguin (*Spheniscus demersus*) and the white-headed vulture (*Trigonoceps occipitalis*). The temporal span of the database ranges between 1943 and 1979, but 32% are from years 1958–1959, and 25% from years 1968–1969. The spatial coverage of the collection is uneven, with 2/3 of the records representing only four of the eighteen provinces of the country, namely Huíla, Moxico, Namibe and Cuanza Sul. It adds, however, valuable information for the Huíla area of the Angolan Scarp, which is probably a biodiversity hotspot of global conservation priority. Furthermore, this georeferenced database adds invaluable bird information to the GBIF network, for one of the countries with highest but less known biodiversity in Africa.

Keywords

Occurrence, Specimen, Angola, Instituto de Investigação Científica Tropical (IICT), Animalia, Chordata, Aves

Introduction

Angola is one of the countries in Africa with highest bird diversity (938 native species, according to Mills and Melo (2013)), including a high number of endemic and threatened species (Stattersfield et al. 1998). It encompasses four main types of ecosystems: Congo lowland basin forests in the north, Angolan miombo woodlands in the centre, Zambesian miombo woodlands in the east, and Namib Desert in the south-west (Dean 2000). Despite its richness, Angola is still one of the least known countries for birds. This lack of knowledge is mainly a consequence of both the Portuguese Colonial war (1961–1974) and the Angolan civil war (1974–2002), which together lasted 41 years (1961–2002), halting scientific studies and expeditions (Dean 2000). Since the end of the civil war, Angolan society and government have focused primarily on infrastructure reconstruction and economic development, with limited attention given to scientific research and natural history studies.

Even today, basic information on Angolan bird species dates mostly from before the national independence in 1974 (Dean 2000, Ministry of Environment 2009). Some recent work has updated our knowledge to some degree (Ryan et al. 2004, Mills 2009, 2010, Mills and Dean 2007, Mills et al. 2011, 2013), including the publication of a national check-list (Mills and Melo 2013). However, historical collections still play a major role in the description of the country's biodiversity. Access to the substantial information collected on the Angolan avifauna is of great importance, considering that the IUCN Red List indicates, the occurrence in the country of one critically endangered, 14 endangered and 10 vulnerable bird species (IUCN 2013). Records should thus be made available in a form that can be readily found and used.

In this paper we provide a comprehensive dataset based on the digitalization, taxonomic revision and georeferencing of the Angolan ornithological collection held by the Instituto de Investigação Científica Tropical (IICT), Lisbon. The dataset is freely available via the Internet, on the IICT IPT provider (<http://maerua.iict.pt/ipt>), and on the

Global Biodiversity Information Facility (GBIF) data portal (<http://www.gbif.org>). It comprises information on 1560 specimens collected in 291 localities throughout Angola. The specimens were collected in expeditions carried out between 1949 and 1979, by 64 collectors. The collection contains some very valuable skins of endemic species, such as of the endemic Red-crested Turaco (*Tauraco erythrolophus* (Vieillot, 1819)) and Grey-striped Francolin (*Pternistis griseostriatus* (Ogilvie-Grant, 1890)). It also contains skins of species listed as conservation concern in IUCN Red List, including two endangered species (the wattled crane (*Grus carunculata* (Gmelin, JF, 1789)) and the Gabela bush-shrike (*Laniarius amboimensis* Moltoni, 1932)), of which there are few skins in other collections (Dean 2000). There are also two species classified as vulnerable (African penguin (*Spheniscus demersus* (Linnaeus, 1758)) and the white-headed vulture (*Trigonoceps occipitalis* (Burchell, 1824))).

General description

The dataset is a subset of the parent bird collection of the Instituto de Investigação Científica Tropical, which holds 5598 preserved specimens (skins), mainly from Angola, Mozambique, Guinea-Bissau, São Tomé and Príncipe, and Cape Verde, available through GBIF at http://maerua.iict.pt/ipt/resource.do?r=iict_cz. The collection scrutinized through this data paper is the subset from Angola, which includes 1560 specimens that were taxonomically revised and georeferenced. The collection shares the largest collectors (A. Rosa Pinto, D. Mumputu and J. Carlos) with the related biggest collection of birds of Angola, based on Instituto Superior de Ciências de Educação da Huíla (ISCED-Huíla), in Lubango. That institute inherited the collections of the former Instituto de Investigação Científica de Angola (IICA), including a bird collection with more than 35 thousand specimens, making it the largest in Africa. Although showing an uneven geographic distributions of samples, with 2/3 of the records concentrated in only four provinces (Huíla, Moxico, Namibe and Cuanza Sul), the collection adds, invaluable information for the Huíla's area of the Angolan Scarp, which is probably a biodiversity hotspot of global conservation priority (Myers et al. 2000), and an important area of bird endemism (Mills 2010).

Project details

Project title: Online Catalogue of Biological Collections of IICT

Funding: This project was funded by the Fundação para a Ciência e a Tecnologia (FCT) through the project “Recovering the past, recording the present, and preparing the future of zoological collections in Portugal (ARCA)” (PTDC/BIA-QOR/71492/2006) and co-funded by CIBIO, Centro de Investigação em Biodiversidade e Recursos Genéticos / InBIO from the University of Porto.

Taxonomic coverage

General taxonomic coverage description: The taxonomic coverage of this dataset spans class, and it includes 24 orders and 69 families (Figure 1). Nearly two thirds of the specimens belong to the order Passeriformes. The Coraciiformes order ranks second, with 5% of the specimens. The families Cisticolidae, Estrildidae and Ploceidae have the highest number of records (136, 114 and 113 records respectively) (Figure 2). The families with fewest records are Bucorvidae, Ciconiidae, Picidae, Spheniscidae, Trogonidae, Turnicidae and Tytonidae, with one record each. The database contains 522 taxa (161 species and 361 subspecies).

Taxonomic ranks

Kingdom: Animalia

Phylum: Chordata

Class: Aves

Order: Accipitriformes, Anseriformes, Apodiformes, Bucerotiformes, Caprimulgiformes, Charadriiformes, Ciconiiformes, Coliiformes, Columbiformes, Coraciiformes, Cuculiformes, Falconiformes, Galliformes, Gruiformes, Musophagiformes, Passeriformes, Pelecaniformes, Piciformes, Podicipediformes, Psittaciformes, Pteroclidiformes, Sphenisciformes, Strigiformes, Trogoniformes

Family: Accipitridae, Alaudidae, Alcedinidae, Anatidae, Apodidae, Ardeidae, Bucerotidae, Bucorvidae, Campephagidae, Caprimulgidae, Certhiidae, Charadriidae, Ciconiidae, Cisticolidae, Coliidae, Columbidae, Coraciidae, Cuculidae, Dicruridae, Emberizidae, Estrildidae, Eurylaimidae, Falconidae, Fringillidae, Glareolidae, Gruidae, Hirundinidae, Indicatoridae, Jacanidae, Laniidae, Laridae, Malaconotidae, Meropidae, Monarchidae, Motacillidae, Muscicapidae, Musophagidae, Nectariniidae, Numididae, Oriolidae, Otididae, Paridae, Passeridae, Phalacrocoracidae, Phasianidae, Phoeniculidae, Picidae, Platysteiridae, Ploceidae, Podicipedidae, Psittacidae, Pteroclididae, Pycnonotidae, Rallidae, Ramphastidae, Remizidae, Scolopacidae, Spheniscidae, Strigidae, Sturnidae, Sylviidae, Timaliidae, Trogonidae, Turdidae, Turnicidae, Tytonidae, Upupidae, Viduidae, Zosteropidae

Common names: Birds

Spatial coverage

General spatial coverage: The geographic range of the collection covers the whole Angola. Distribution of sampling locations is presented in Figure 3, including counts of records per grid cell, in a half a minute grid. The distribution among the Angolan provinces is uneven, with the following series: Huíla (320), Moxico (293), Namibe (202), Cuanza Sul (166), Cuanza Norte (107), Cunene (88), Cuando Cubango (54),

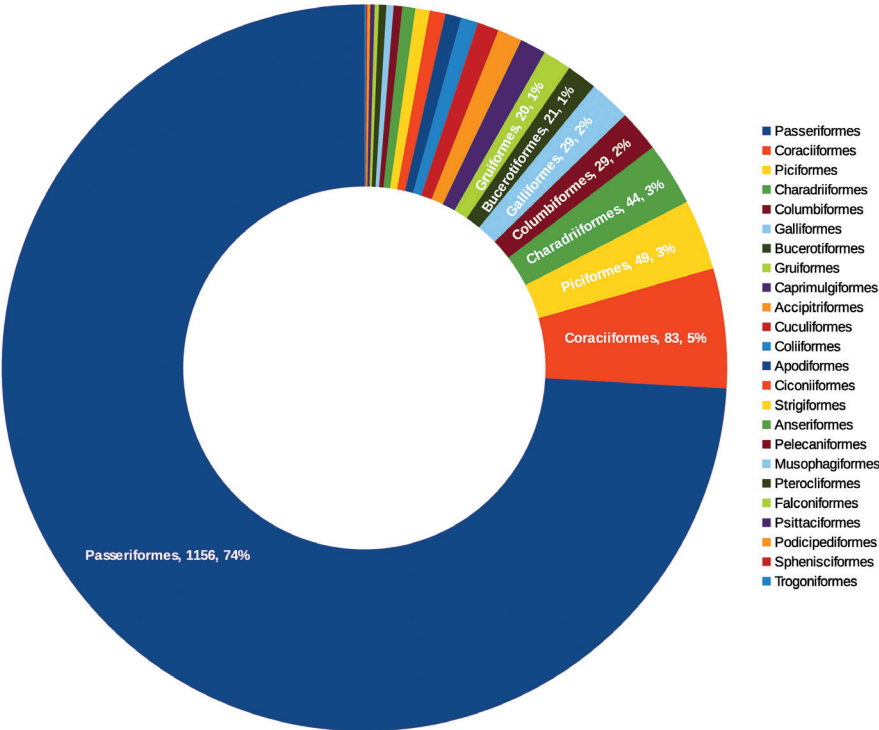


Figure 1. Number and percentage of specimens per orders. Only the categories of orders having 20 or more specimens are labeled.

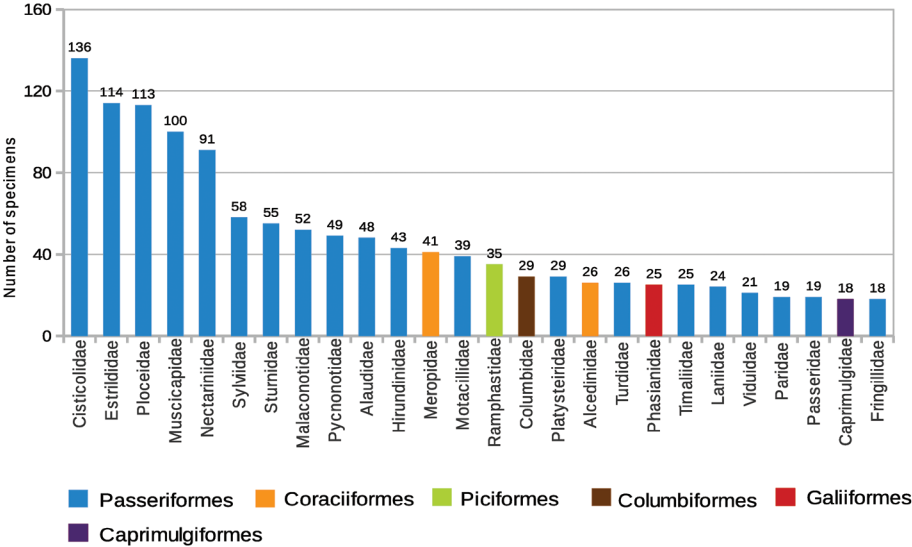


Figure 2. Number of specimens per family. The families pictured represent 80% of the number of specimens in the collection.

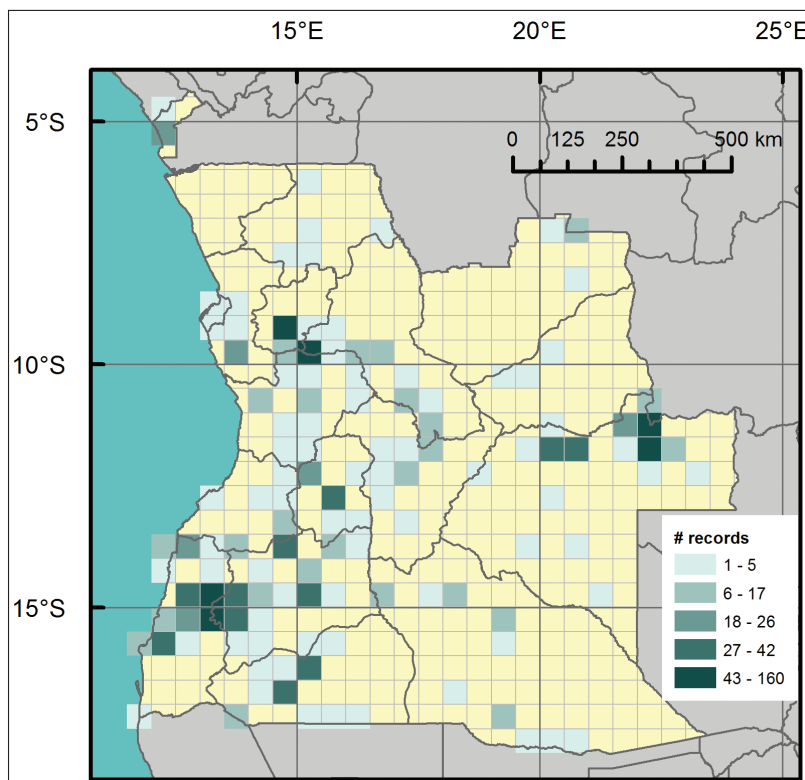


Figure 3. Distribution of occurrence records with indication of number of records indicated on a half a minute grid system.

Huambo (51), Malanje (51), Benguela (35), Bengo (29), Cabinda (26), Bie (21), Lunda Norte (16), Lunda Sul (9), Uíge (9), Luanda (1). No records occur in the province of Zaire, in the north-west region of Angola. The province of collection is unknown for 82 specimens. The research unit in Angola where the main collectors were based was located in Huíla, which justifies the highest value found for that province.

Coordinates

18°30'36"S and 4°5'60"S Latitude; 10°2'24"E and 24°51'0"E Longitude

Temporal coverage

The temporal range of the records is between 1943 and 1979, (Figure 4). Two peak periods are observed, in 1958–1959, and in 1968–1968, with more than 200 samples per year.

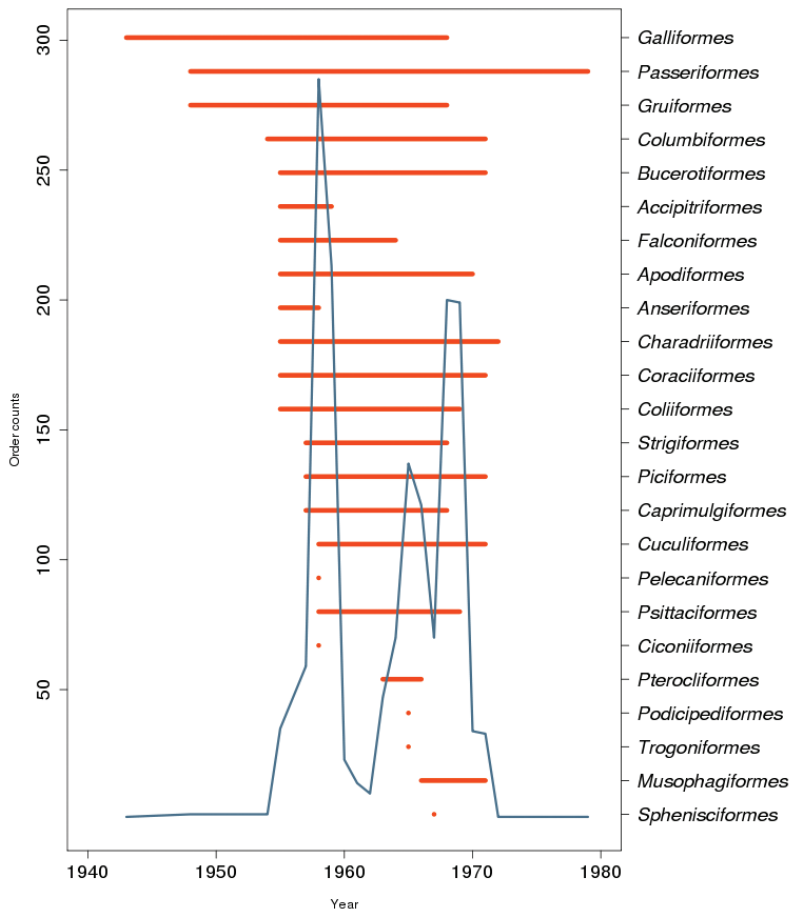


Figure 4. Temporal profile of the specimens in the collection. The time range for each order is represented by the horizontal bars.

Natural collections description

Parent collection identifier: 24798813-aaff-4292-98ef-8c9bc415ff14

Collection name: IICT - Coleção de Aves de Angola

Collection identifier: 9B48F857-91B6-4029-9AEF-A80F7852EC89

Specimen preservation method: Dried

Curatorial unit: 1560 with an uncertainty of 0 (skins)

Methods

Method step description: The general procedure for the processing of specimens databasing and georeferencing is represented in Figure 5. The mammal and bird collections of the IICT were initially catalogued under the scope of project ARCA (2008–2010),

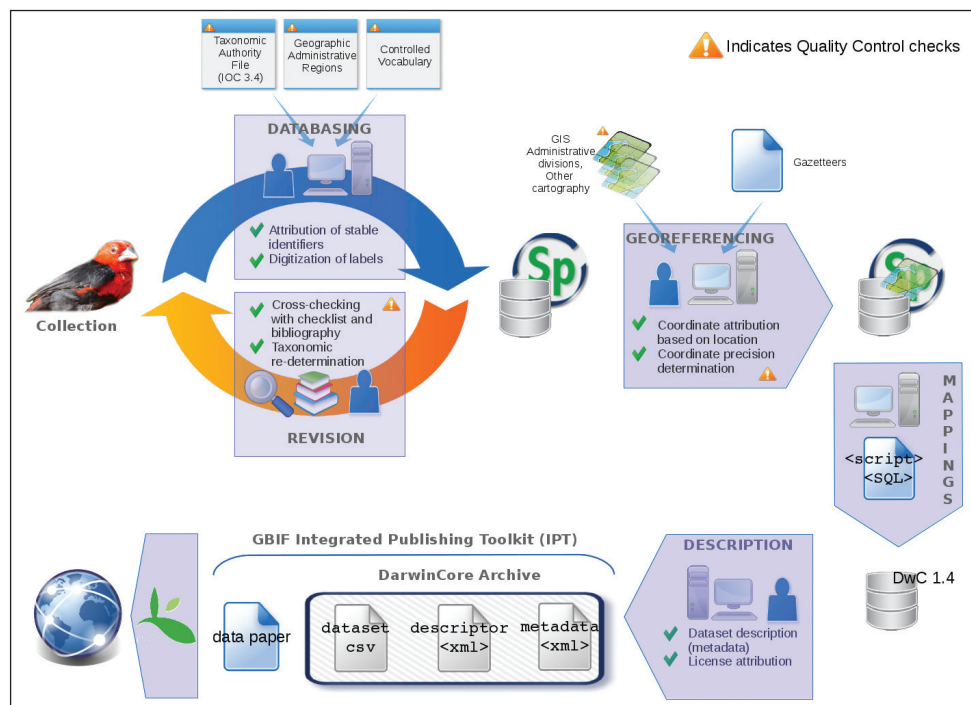


Figure 5. Synoptic of the procedure to digitize and publish the dataset online.

using the software Specify Workbench, and afterwards imported to software Specify version 6 (Specify Software Project 2013). Whenever available, the descriptions of eye, beak and foot colour, and total length were also included.

Since at that time no taxonomic specialists were available to revise the collection, records were catalogued as they were labelled, without taxonomic revision or update of taxonomic names.

In 2012–2013, the IICT collection of Angolan birds was fully taxonomically revised. This taxonomic revision followed the IOC bird list (Gill and Donsker 2013) and all skins were labelled with a new catalogue number and the original information was thereafter included in the collection manager software Specify 6. Additionally, the specimens' original information was re-checked at this phase for any initial cataloguing errors.

Since no georeferencing information was available on specimen labels or associated documentation, geographic coordinates were determined following procedure and recommendations by Chapman and Wieczorek (2006). Several geographic gazetteers were used to determine coordinates, based on the location information: Geolocate, Google Maps, Google Earth. Furthermore, the cartographic series 1:100 000 of Angola was used to find additional sites not available at gazetteers or to fine-tune coordinate uncertainty. The uncertainty of the coordinate was recorded whenever possible. For 88 records it was not possible to determine coordinates due to insufficient location information. All coordinates are given in geographic format, decimal degrees, datum WGS 84.

Study extent description: The study covers most of Angola, including 17 out of the 18 provinces. The best-represented provinces are Huíla, Moxico, Namibe and Cuanza Norte. Only the province of Zaire (NW Angola) is not represented in the collection. The temporal distribution is mainly concentrated in the decades of 1950s (especially in years 1958 and 1959) and 1960s, corresponding to 95% of the records.

Sampling description: More than one thousand records of this dataset resulted from expeditions and studies carried out by the former Section of Ornithology at the Instituto de Investigação Científica de Angola, coordinated by António Augusto da Rosa Pinto between 1958 and 1974. Some scientific results of these studies, for the non-passerine group were published in Rosa Pinto (1983).

Quality control description: Information from each specimen was catalogued in Specify 6, which involved two steps: i) digitalization of specimen's records (performed by MR, DR, IQN and SC); and ii) taxonomic revision and data checking (performed by the first author). The authors LR and MM also contributed to taxonomic revision of the specimens. Scientific names were checked with a taxonomic thesaurus built from the IOC World Bird List (v 3.34) (Gill and Donkster 2012). Georeferencing followed recommendations by Chapman and Wieczorek (2006), including the determination of uncertainty of coordinates, in particular when no sufficient information was available from the specimens' records and label, to attribute a specific locality of origin (e.g. names of administrative regions, names of rivers).

Datasets

Dataset description

Object name: Darwin Core Archive The collection and database of Birds of Angola hosted at IICT (Instituto de Investigação Científica Tropical), Lisboa, Portugal

Character encoding: UTF-8

Format name: Darwin Core Archive format

Format version: 1.0

http://maerua.iict.pt/ipt/archive.do?r=iict_bird_angola

Distribution: http://maerua.iict.pt/ipt/archive.do?r=iict_bird_angola

Publication date of data: 2013-10-09

Language: Portuguese

Licenses of use: Use of the data for commercial or for-profit applications is permitted only via written permission from Instituto de Investigação Científica Tropical. Data are provided to users, but should not be passed on to third parties or redistributed. It is explicitly forbidden to incorporate these data into other databases of free or restricted access.

Metadata language: English

Date of metadata creation: 2013-08-22

Hierarchy level: Dataset

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